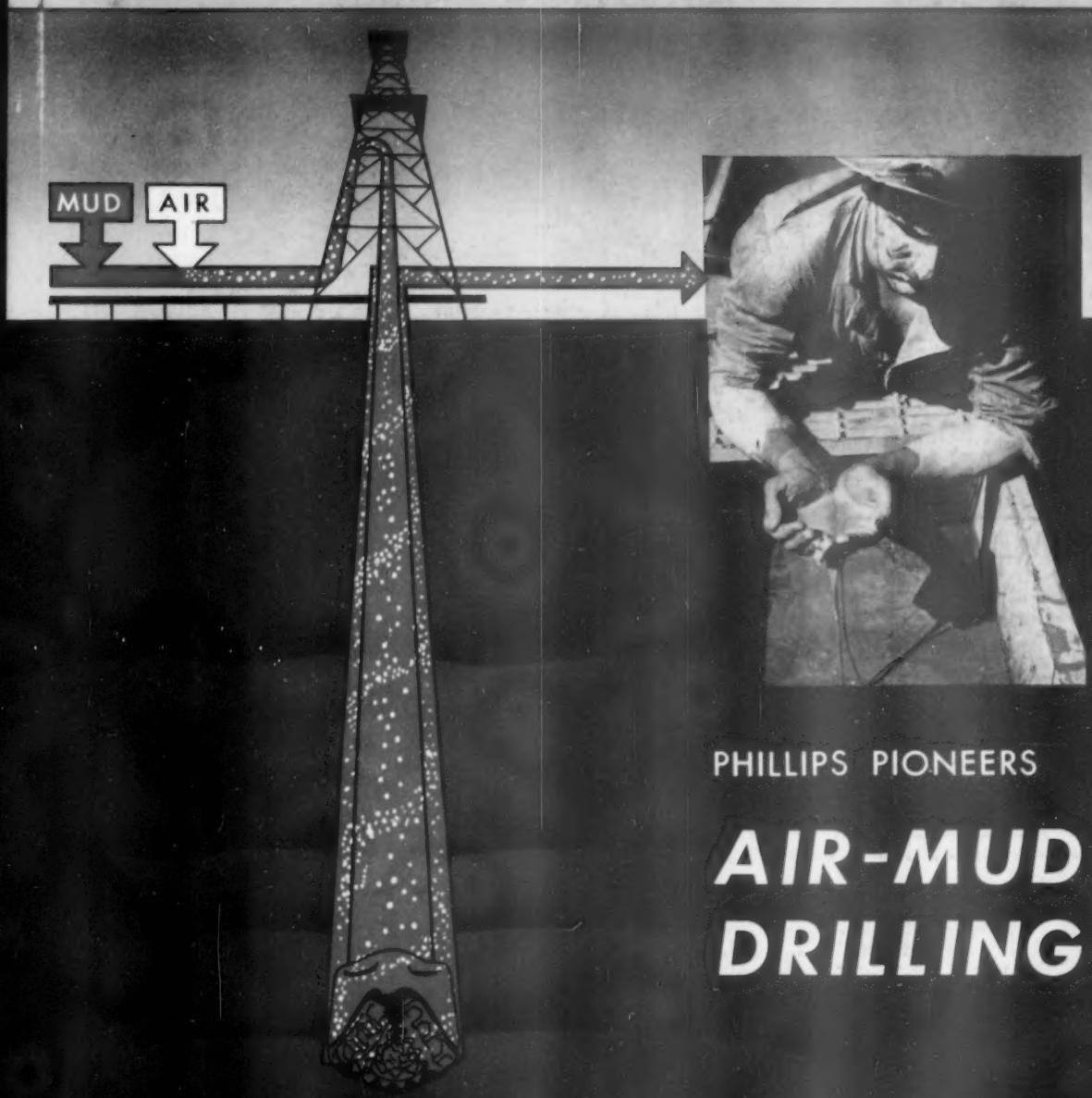
JANUARY 24, 1955

the OIL AND GAS JOURNAL



PHILLIPS PIONEERS

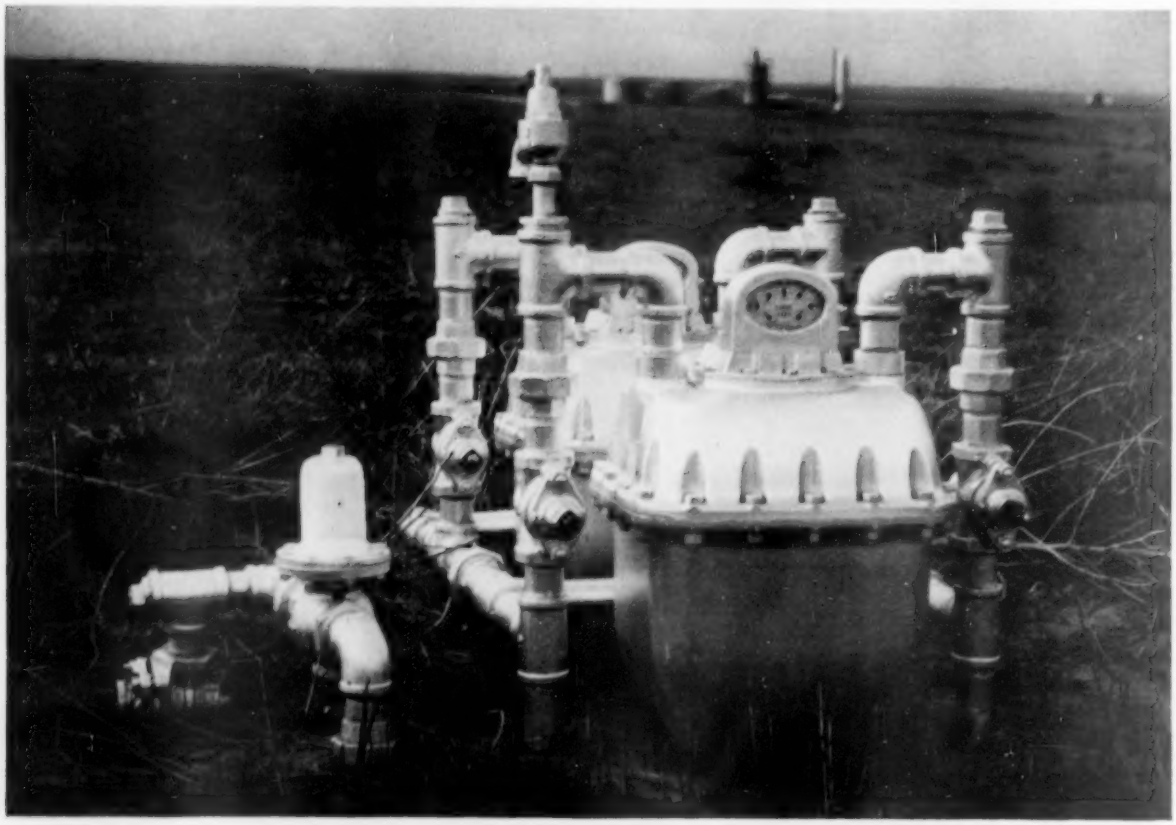
AIR-MUD DRILLING

Tests reveal: lost circulation reduced; bit penetration and footage increased. Page 82

A New Major Company in the Making? . 60

How to Tie in Pipeline Boosters Without Shutdown . 88

For Field, Farm or Factory



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PAGE ONE

. . . A Glance Ahead

Straight-hole drilling will be made easier by a mathematical study nearing completion. Field tests show it will give drillers a formula for concentrating stabilizer weight proper distance above drill bit.

Total demand for crude and products may reach 9,500,000 bbl. daily this month—highest in history and 5.7 per cent above January 1954.

Preference to smaller wells in proration allowables will be big issue in several states this year if crude oversupply continues. Majority of independents favor it, but it discourages deep drilling when bigger wells must stand bulk of curtailment.

Stream pollution will soon be big headache for oil operators in many areas. State officials in Texas, Oklahoma, elsewhere are considering new teeth for pollution laws, believe enforcement has become too lax.

Astonishing total of 53,000 wells completed last year must be viewed in light of fact that bulk of gain was in older and shallower areas where formation fracturing and favorable allowables promised payout for small producers.

Canadian Government will give serious consideration to changing its 40-year-old "fluid export" law to facilitate export of gas to U. S. Designed to regulate electricity sales but never enforced, law now permits Dominion authorities to cut off gas exports on short notice regardless of contracts.

Hottest thing in gas pipeline engineering is the challenge to the long-standing dominance of engine-driven reciprocal compressors. Gas-turbine-driven centrifugal compressor, once thought to have the edge, may yield the future to engine-driven centrifugal. Advantages: Simpler controls, lower gas consumption.

New Mexico officials are considering court action to prevent FPC from fixing price of gas from state-owned lands. Bids for state gas leases have dropped 50 per cent since FPC intervened. Might be another states-rights fight like tidelands.

The fully automatic refinery moves nearer as two new plants install all-electronic controllers. System may edge out pneumatic instrumentation because its greater flexibility will permit eventual automation by electronic computers.

the OIL AND GAS JOURNAL

JANUARY 24, 1955 • VOLUME 53 • NUMBER 38

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TECHNOLOGY AND OPERATION

Phillips Tests Air-Mud Drilling 82

By Roy A. Bobo, George S. Ormsby, and R. S. Hoch

Results show lost circulation is reduced and both bit penetration and footage are increased. The air-mud mixture is produced by injecting compressed air into the standpipe. Corrosion of the drill pipe can be economically controlled by chemical means. Advantages over air or gas drilling: it is safer; cuttings are larger; hole deviation is less; and hole will stand up better. For thumbnail sketch of background of story, see "Cover Story" at lower right, this page.

Tie In Boosters Without Shut Down 88

By N. J. McGory

A new technique of big-inch high-pressure pipe plugging can be utilized to add pipeline booster stations without interruption of operations or loss of oil. Platte Pipe Line Co. recently added five to its 20-in. main line from Wyoming to Wood River, Ill.

How Continental Trains Geophysicists 91

By Harold R. Prescott

Recruits from colleges spend 12 to 18 months in training, largely with a seismic field crew.

Check Your Plant Ground Connections 92

By Ernest C. Benjamin and James V. Cundelan

Loose or corroded ground connections have caused many disastrous plant fires and serious accidents, even though they seem relatively unimportant. The hazards are particularly serious in oil processing and petrochemical plants.

New Formation-Correlation Tool 95

By George B. Mangold

Differential thermal analysis is inexpensive tool for obtaining greater insight into subsurface conditions. Results, obtainable while drilling, are in terms of mineral composition of cuttings and cores.

Minimum Gasoline-Plant Costs 97

By L. E. Woodruff

Boilers are eliminated, hot oil is used for heating, and maximum use is made of aerial cooling at the Wayside Honor Rancho plant of The Texas Co. near Castaic, Calif.

Electric Power for Water Flooding 99

By J. H. Hatfield and Frank Beach

Cities Service operates eight water-flood projects plus production facilities with 60 men using electrically operated equipment. Before water flooding started, 75 men were required to handle the same leases under stripper operation. Saving is largely due to installation of electric units.

Time-Cycle Balance of Pumping Wells 103

By Rex N. Brown

Proper schedule will result in increased production and lower costs.

Mustang Island Processing Plant 104

By F. Lawrence Resen

Renwar Oil's installations on this South Texas island process 30 M.M.c.f.d. of wet gas from offshore wells, use untreated salt water for plant cooling, and are set on a 6-ft.-high fill-in for protection from the sea.

Hydraulic Decoking at Cities Service 111

A picture sequence showing the steps involved in hydraulic decoking of a delayed coking unit.

On-The-Job: In the Plants 113

How a new hot-oil heater boosts crude-distillation output; how to replace tubes in a water-tube boiler; other helpful hints.

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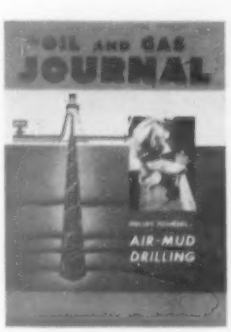
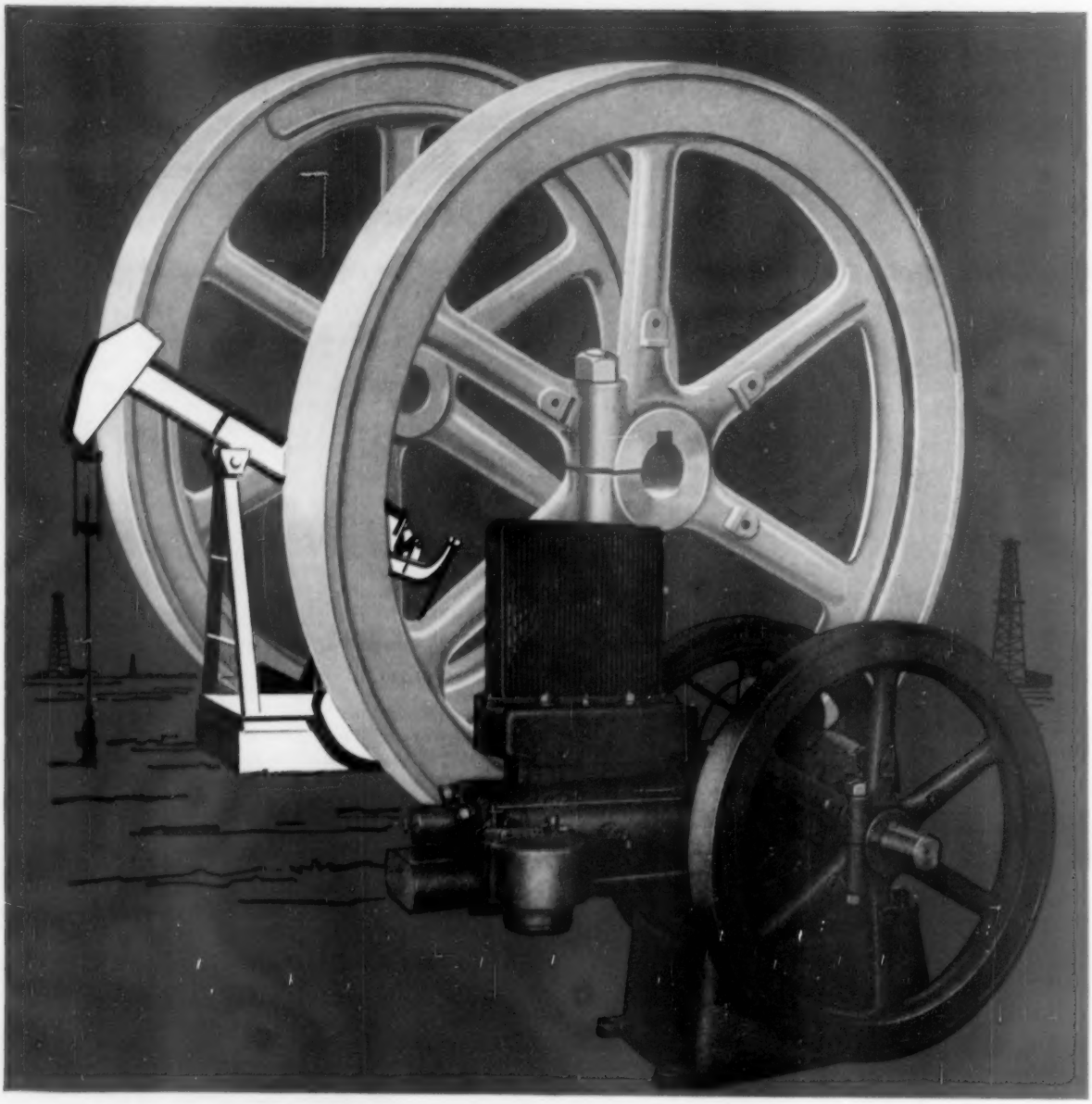
COVER STORY

Authors Roy Bobo, George Ormsby, and R. S. Hoch of Phillips Petroleum Co.'s drilling engineering division, Houston, encountered some tough drilling problems in West Texas when using conventional muds. They needed mud to control hole deviation and prevent sloughing, so air drilling wasn't the answer. Aerated mud was, however.





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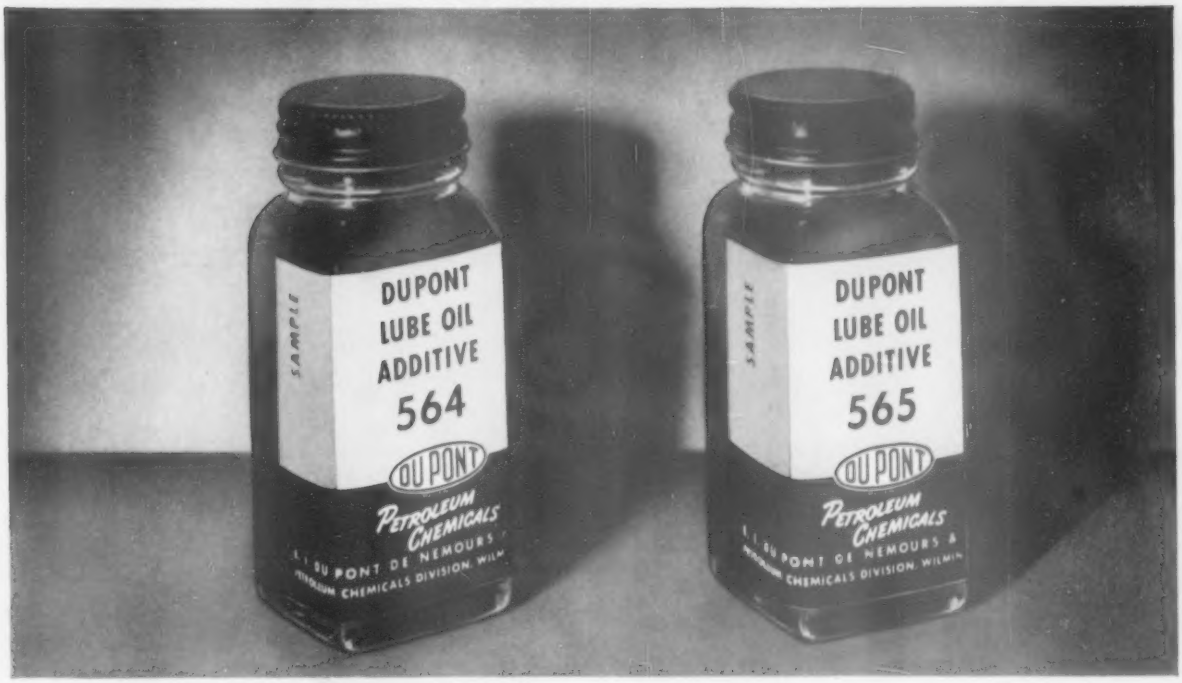
Du Pont's new polymeric additives help prevent engine sludge under low-duty driving conditions



Which of these two new lube oil additives will do most to help sell your motor oil?

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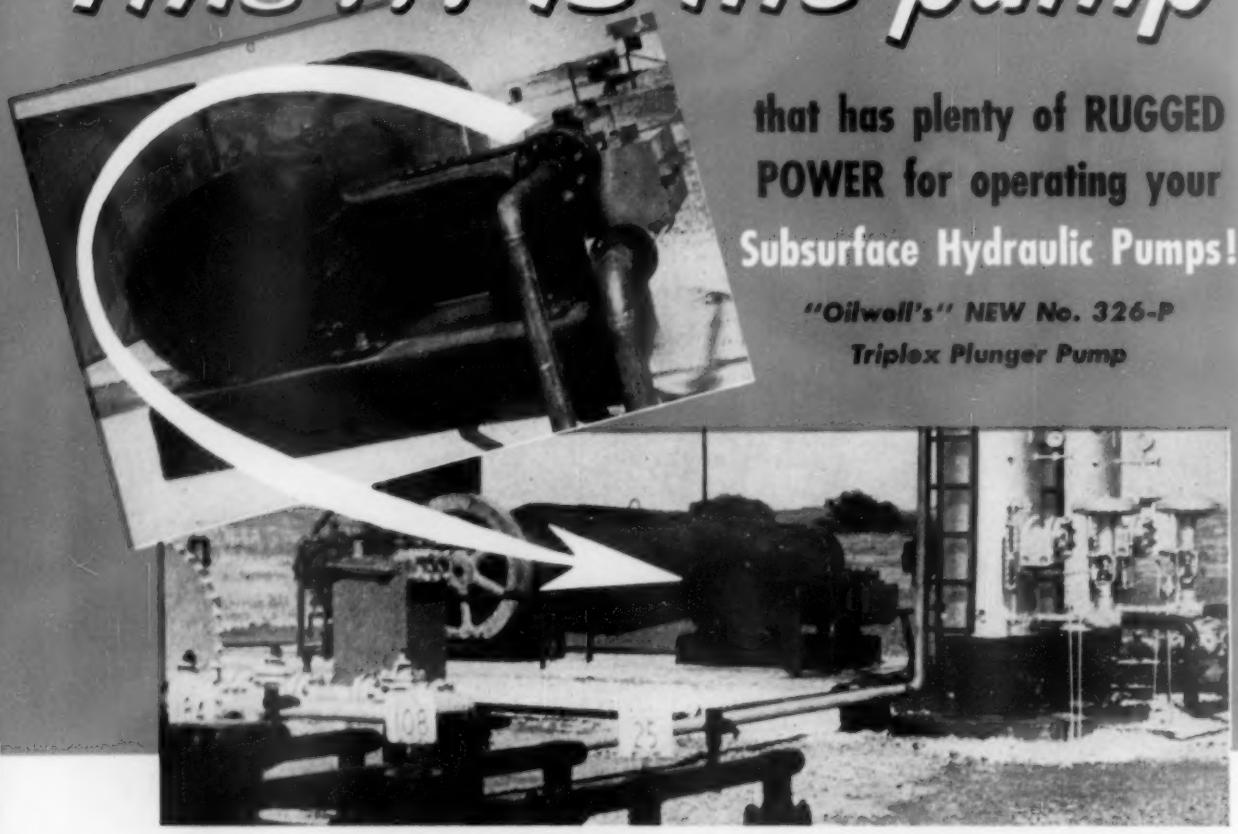

"OILWELL" No. 326-P Triplex Plunger Pumps are designed to meet the exacting conditions encountered in handling the power oil for operating subsurface hydraulic pumps.

Horizontal heavy-duty construction results in low suction and minimum line vibration. Moderate speed operation lengthens valve, plunger and packing life. Over-size shafting, bearings, connecting rods, etc. together with force feed lubrication results in long trouble-free service and reduced maintenance.

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			60	80	100	120	140	160	180	200
1½	5650	.138	285	380	475	570	665	760	855	950
1¾	4150	.188	389	518	648	778	907	1037	1167	1297
2	3180	.245	501	667	835	1002	1168	1335	1502	1670
2¼	2520	.310	639	852	1064	1277	1490	1703	1915	2125
Pinion Shaft rpm with:										
Gear Ratio, 4.44:1			266	355	444	533	622	710	800	888
Gear Ratio, 3.12:1 *			187	250	312	375	437	500	562	624
Actual Brake Horsepower Required			32	43	54	64	75	86	96	106

* Special Ratio Furnished on Request

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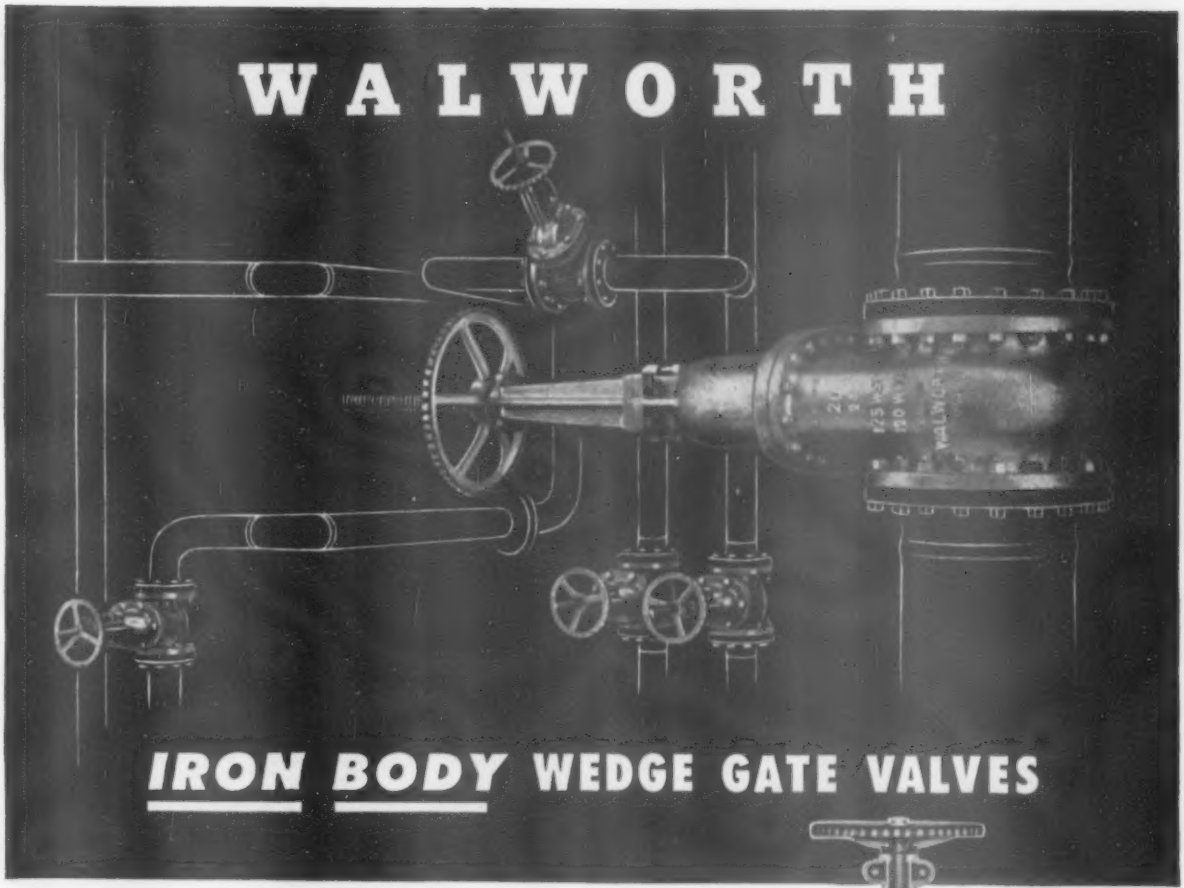

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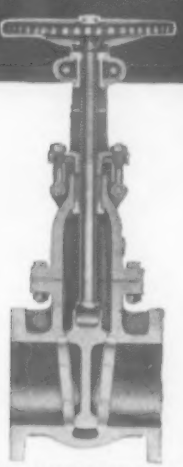

Walworth No. 726F OS&Y (Outside Screw and Yoke) Iron Body Wedge Gate Valve. OS&Y valves are recommended for services where it is desirable that the line fluid does not come in contact with the stem threads. Note the swing-type gland-eye-bolts for easy repacking. Sizes 2 to 30 inches.

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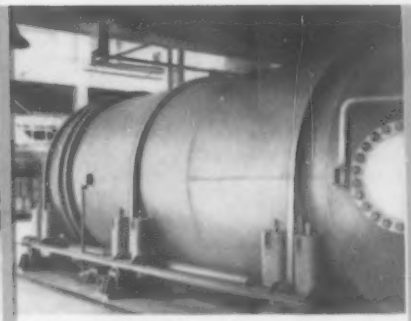
Base for supporting refinery tower, provided with Grinnell Spring Hangers for flexible support.



Grinnell Spring Hangers on large vessel of catalytic cracking unit in oil refinery.

Induced draft duct and blower in power station. Operates at about 500°F. Supported by Grinnell Spring Hangers.

To support loads that won't stand still . . .

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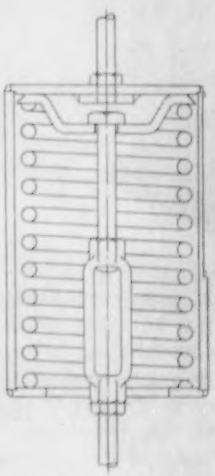
- Solid steel casing protects spring from damage and weather. Guides assure continuous alignment and concentric loading of spring.
- 18 sizes available from stock — load ranges from 53 lbs. to 12,000 lbs.
- Easy selection of proper sizes from simple capacity table.
- Installation is simplified by integral load scale and travel indicators.

*Precompression is a patented feature.



VARIABLE SPRING HANGER FIG. B-268

Fig. B-268, Type A, is designed for attachment to its supporting member by screwing a rod into a bushing in the top cap of the hanger. Adjustment of the hanger load is accomplished by turning the turnbuckle on the lower hanger rod until the hanger picks up the load and the load indicator points to the desired position. Six other types of attachment are available.

Grinnell Variable Spring Hangers are also available in half sizes (Fig. B-82); and in double spring sizes (Fig. B-98).

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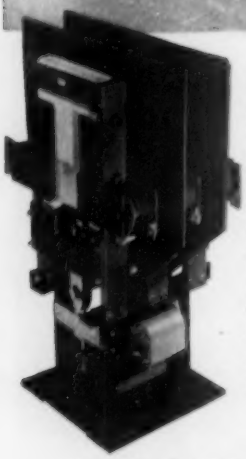

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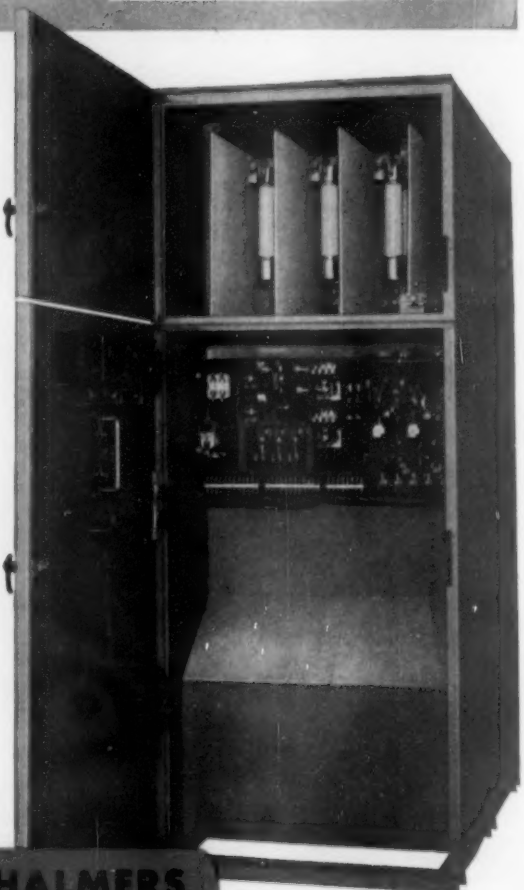
When the going's rough . . . that's the place for the Type 256 air-break contactor. Frequent starting, inching, reversing or dynamic braking are taken in stride by this rugged performer. And, of course, fire hazard is greatly reduced. No turning shafts, shaft bearings and flexible leads to cause maintenance headaches. Double-break contacts, vertical action and dual blowouts provide long, trouble-free operation.



OIL-IMMERSED CONTACTOR

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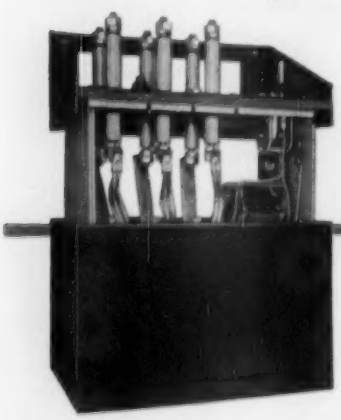

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——— *with a* MICHIGAN

Notice two facts about this operation:

1 **More than 2 yards in that 1 yard capacity bucket—a 100% bonus load!**

The independent bucket control on MICHIGAN tractor shovels makes this kind of performance possible. Two powerful double-acting cylinders on the MICHIGAN bucket provide tremendous break-out power, enable the operator to "work" the bucket while it's buried deep in the pile. His bucket-control lever *over-rides* the boom-hoist, so he doesn't have to lift the bucket out of the pile *until* he's got a heaping bonus-load.

2 **All wheels solidly on the ground!**

Here's proof of the MICHIGAN'S bonus margin of weight distribution. These are the heaviest, most powerful tractor shovels on the market today. Even with a 100% bonus bucket load, you still have complete stability and traction.

One brief demonstration will convince you quickly that you'll get a Bonus Bucket every time with a MICHIGAN Tractor Shovel—for more yardage moved, in fastest time, at lowest cost. Such a test is easy to arrange—simply call your nearby MICHIGAN distributor; or use the coupon. MICHIGAN Tractor Shovels are available under the Clark leasing Plan—we'll be glad to send you details.

CLARK EQUIPMENT

CLARK EQUIPMENT COMPANY
Construction Machinery Division
448 Second Street
Benton Harbor, Michigan

23

What's this about demonstrating the MICHIGAN Tractor Shovel?

Also, send us ☐ Specifications . . . and ☐ Lease Plan data sheet

Name_____

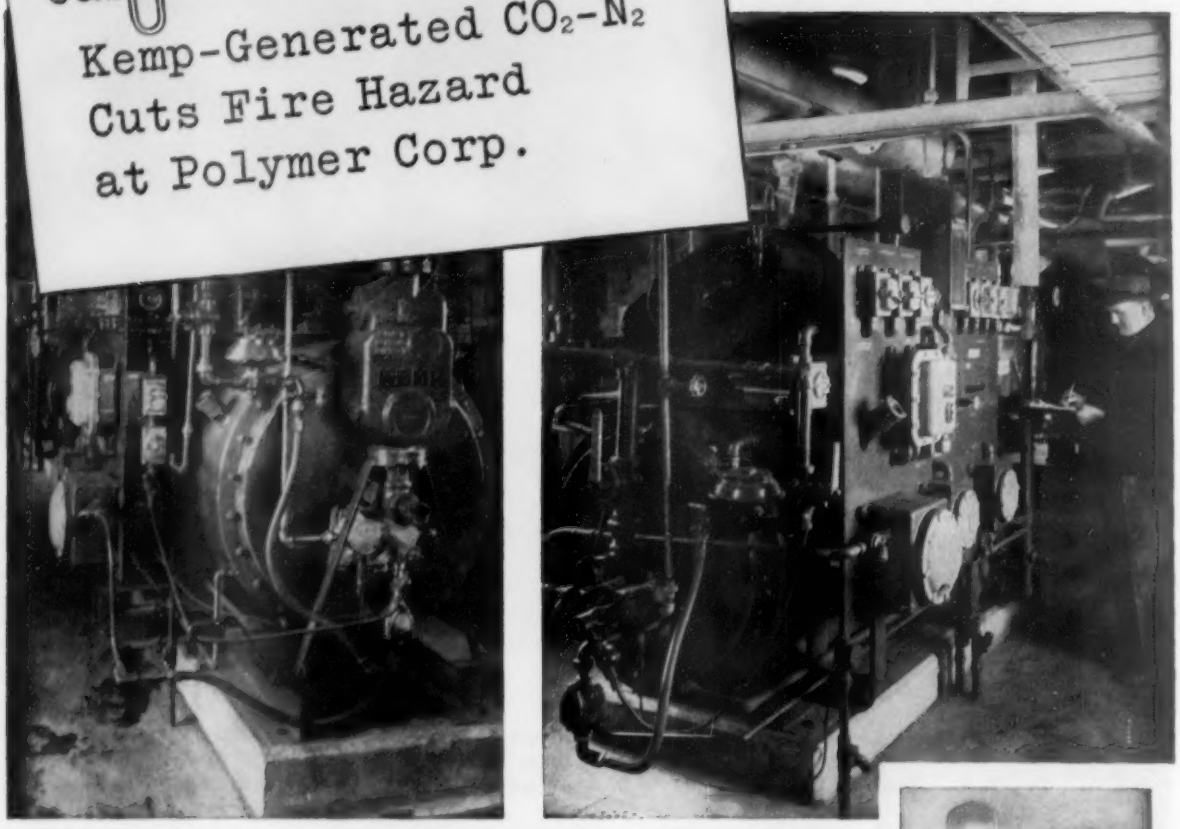
Firm_____ Title_____

Address_____

City_____ County_____ State_____

Case No. 62

Kemp-Generated CO_2-N_2 Cuts Fire Hazard at Polymer Corp.



How Polymer operated day and night for 10 years at maximum safety

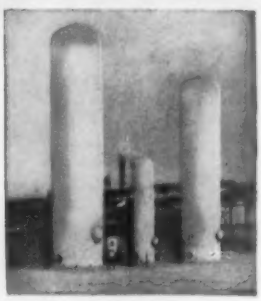
When Polymer Corporation, Ltd., Sarnia, Ontario, began operations in 1943, inventory included two Kemp MIHE Inert Gas Generators. Since that date, Polymer—and its Kemp equipment—has been operating 24 hours a day, 365 days a year. The huge quantities of man-made rubber and associated chemicals it produces—200,000,000 pounds during one year alone—reach, in one form or another, the four corners of the world.

Kemp Plays an Important Role

The high volatility of many of the ingredients used in this giant operation necessitates blanketing and purging vessels after use. It is in this step that Polymer employs Kemp Generators to assure safe, trouble-free performance. The gas they produce is piped to different operations over the entire company area—it *must* be clean! Kemp does the job—Polymer knows that it can depend on Kemp to deliver a *clean inert at a specific analysis, regardless of demand*. And every Kemp Generator is engineered for fast starts and easy operations that save *time* and *money*.

Kemp Can Do a Job for You

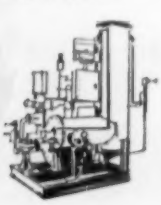
Kemp superiority is no accident. It is based on years of experience . . . on quality of design to meet specific problems. Every Kemp design features the Kemp Industrial Carburetor for complete combustion without tinkering or waste . . . for simplified installation and maintenance. Every Kemp design includes the latest fire checks and safety devices. If you have a blanketing or purging problem, contact Kemp engineers. They will be glad to study your situation and recommend the installation best suited to your needs. No obligation, of course.



Gas generator building from which inert gas is piped over 130 acres of company property at Polymer's Sarnia, Ontario, operation.

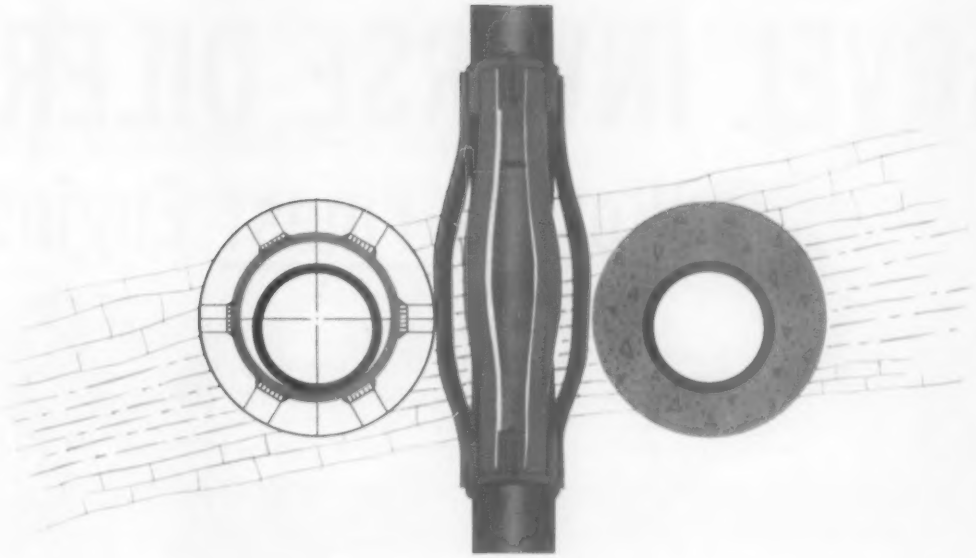
For more complete facts and technical information, write for Bulletin I-10 to: THE C. M. KEMP MFG. CO., 405 East Oliver Street, Baltimore 2, Md.

KEMP OF BALTIMORE



INERT GAS GENERATORS

CARBURETORS • BURNERS • FIRE CHECKS
METAL MELTING UNITS • ADSORPTIVE DRYERS
SINGEING EQUIPMENT



MORE UNIFORM CEMENTING *AND*
MAXIMUM CASING PROTECTION

with HALLIBURTON'S

S-3 CASING CENTRALIZERS

Because the S-3 Centralizer has heavier, load-tested springs *and because* the S-3 Centralizer has an exclusive design that prevents springs from touching casing, you can be sure of more uniform cementing and maximum casing protection every time! Even in key seats, tight hole and other critical areas, all casing is fully protected and held away from the wall until a stronger, long-lasting cement job can be completed.

The rugged strength of the S-3 Centralizer has been proved in thousands of field tests where loss of bowed-height in each spring after permanent set was as low as 3.94%—considerably less than in ordinary centralizers. And with the springs transmitting the centering load to the end bands, the stronger springs never touch casing nor permit casing to be damaged by sidewall. Torque is reduced, ample annular clearance is obtained and sidewall is undamaged with the exclusive features of Halliburton's S-3 Centralizer.

Other S-3 advantages—freer circulation in annulus, faster installation and hinge type design—allow you to get the most in centering and protective force with more economy. For full information on the S-3, get your free copy of the Halliburton Centralizer bulletin with complete spacing charts for all casing sizes and hole deviation conditions. It's a valuable guide to successful, first-time cementing with the dependable S-3 Casing Centralizer. Call your local or district office of the Halliburton Oil Well Cementing Company.

HALLIBURTON

CEMENTING EQUIPMENT

211 SERVICE CENTERS — JUST MINUTES AWAY FROM ANY RIG

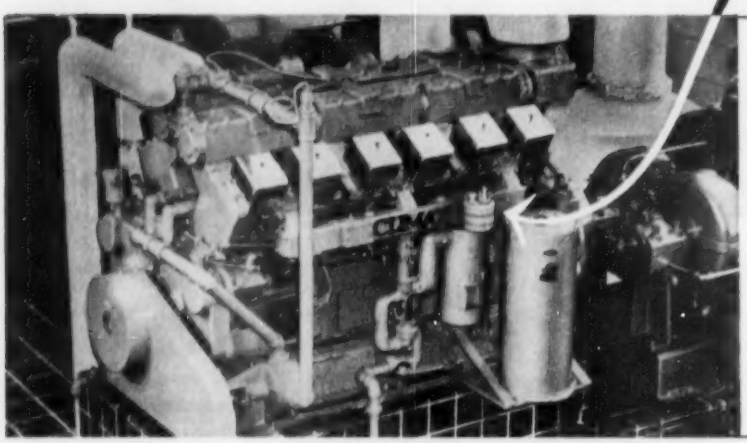
MARVEL INVERSE OILER–
Vital Part of World's Finest Engines

Engine manufacturers think so highly of the Marvel Inverse Oiler they have incorporated it as a vital unit in their engines' lubrication systems.

They have found that engines, equipped with Marvel Inverse Oilers, can be depended upon to give quick acceleration to save trip time . . . keep operating costs to a minimum . . . guarantee hours of continuous performance . . . keep "down-time" low by extending periods between overhauls.

The famous Climax Engines, one of which is pictured below, is an example. A truly fine performer, it is equipped with a Marvel Inverse Oiler for Marvel Mystery Oil—finest performing lubricant of all.

The Marvel Inverse Oiler feeds Marvel Mystery Oil in exact proportion to engine speed and load . . . properly lubricating valves and guides, preventing wear and sticking. Keeps upper piston rings free in their grooves . . . retards ring flutter . . . and cushions ring pounding which can result in ring breakages. Remember, it is the *oil* which must do these things and only Marvel Mystery Oil is blended for this purpose and for this oiler.



The Marvel Inverse Oiler

is an integral part of the Climax 12 cylinder, 171 H.P., 600 RPM GAS ENGINE. Operating off the intake manifold, this completely automatic Oiler feeds Marvel Mystery Oil exactly in proportion to engine loads . . . gives direct protection to the all-important upper cylinder areas.

This Chart shows the proper setting for constant load engines

BRAKE H. P. AT BELT	NAT. GAS CU. FT. PER HOUR	BUTANE GALLONS PER HOUR	GASOLINE GALLONS PER HOUR	M. M. OIL DROPS PER MIN.	M. M. OIL HOURS PER QUART
10	115.	1.07	1.12	4	228
15	172.5	1.60	1.68	6	152
20	230.	2.14	2.24	8	114
25	287.5	2.67	2.80	10	91
30	345.	3.21	3.36	12	76
35	402.5	3.74	3.92	14	65
40	460.	4.28	4.48	16	57
45	517.5	4.81	5.04	18	50
50	575.	5.35	5.60	20	45
60	690.	6.42	6.72	24	38
70	805.	7.49	7.84	28	32
80	920.	8.56	8.96	32	28
90	1035.	9.63	10.08	36	25
100	1150.	10.70	11.20	40	23
120	1380.	12.84	13.44	48	19
140	1610.	14.98	15.68	56	17
160	1840.	17.12	17.92	64	14
180	2070.	19.26	20.16	72	12
200	2300.	21.40	22.40	80	11
225	2587.5	24.00	25.20	90	10
250	2875.	26.75	28.00	100	9
275	3162.5	29.42	31.10	110	8
300	3450.	32.10	33.60	120	7

Chart shows total oil consumption

EXAMPLE:—If you use 805 cu. ft. of dry gas, 7.49 gallons of butane or 7.84 gallons of gasoline, your H.P. is about 70, so adjust oiler to feed 28 drops per minute. You will then receive about 32 hours per quart of MARVEL MYSTERY OIL.

If engine load increases after setting for normal load, oiler will automatically increase its feed, decreasing when load is lessened.

To determine drop count per oiler when more than one is used on an engine—divide recommended drop count by number of oilers.

NOTE: Guarantee on oiler is void if any other oil than MARVEL MYSTERY OIL is used. Some *engines* also carry this guarantee policy.

See Your Local Jobber or Oil Well Supply House

EMEROL MFG. CO.

Dept. 365, 242 West 69th Street New York 23, N. Y.

From Every Standpoint / output • size • efficiency

Chrysler Industrial V-8 Engines are the best power you can install

Chrysler Industrial V-8 Engines are . . . pound for pound . . . the world's most powerful gasoline industrial engines.

To prove that statement let's look at the facts. In the charts below, we compare Chrysler Ind. 24A V-8 Engine with similarly equipped products of five principal competitors. Information on each competitive engine is based upon factory specifications. Check the Chrysler advantages—each of them is an important factor in the selection of a power plant.

Engine	Horsepower and Piston Displacement	Pounds per Horsepower	Fuel Consumption —pounds per BHP per hour	Horsepower per Cubic Inch Displacement	
Engine A	110 at 2200 RPM 358 cu. in.	(Stripped Engine) 7.38	.54	.307	**CHRYSLER ADVANTAGES OVER ENGINE A** . . . delivers 18 more horsepower . . . weighs 96 pounds less with 24% less weight per horsepower . . . uses 7.5% less fuel at average operating speed . . . delivers 26% more horsepower per cubic inch displacement
Chrysler Model Ind. 24A	128 at 2200 RPM 331 cu. in.	(Stripped Engine) 5.58	.50	.387	
Engine B	104 at 2400 RPM* 330 cu. in.	(Stripped Engine) 6.92	(Information not available)	.315	**CHRYSLER ADVANTAGES OVER ENGINE B** . . . delivers 34 more horsepower . . . weighs 5 pounds less with 25% less weight per horsepower . . . delivers 32% more horsepower per cubic inch displacement
Chrysler Model Ind. 24A	138 at 2400 RPM 331 cu. in.	(Stripped Engine) 5.18	.50	.416	
Engine C	99 at 2200 RPM 320 cu. in.	(Stripped Engine) 7.64	.56	.309	**CHRYSLER ADVANTAGES OVER ENGINE C** . . . delivers 29 more horsepower . . . weighs 60 pounds less with 27% less weight per horsepower . . . uses 10.5% less fuel at average operating speed . . . delivers 25% more horsepower per cubic inch displacement
Chrysler Model Ind. 24A	128 at 2200 RPM 331 cu. in.	(Stripped Engine) 5.58	.50	.387	
Engine D	117 at 2200 RPM 317 cu. in.	6.5**	.50	.369	**CHRYSLER ADVANTAGES OVER ENGINE D** . . . delivers 11 more horsepower . . . weighs 19 pounds more *but* with 6% less weight per horsepower . . . delivers 5% more horsepower per cubic inch displacement
Chrysler Model Ind. 24A	128 at 2200 RPM 331 cu. in.	6.1**	.50	.387	
Engine E	97 at 2200 RPM 372 cu. in.	(Complete Engine) 12.85	.58	.260	**CHRYSLER ADVANTAGES OVER ENGINE E** . . . delivers 31 more horsepower . . . weighs 395 pounds less with 48.7% less weight per horsepower . . . uses 14% less fuel at average operating speed . . . delivers 49% more horsepower per cubic inch displacement
Chrysler Model Ind. 24A	128 at 2200 RPM 331 cu. in.	(Complete Engine) 6.6	.50	.387	

**Information not available at 2200 RPM* ***Complete engine less flywheel housing*

These are not just "paper advantages". They show up on irrigation pumps, in construction and road building equipment, in farm combines, and in many other applications. Thanks to modern engineering, hemispherical-design combustion chamber, short-stroke, low-friction construction, Chrysler offers durability and output in amazingly small, lightweight power packages.

And remember Chrysler Industrial Engines can be factory equipped for operation with gasoline, natural or L-P gas.

See a dealer or write: Dept. 151, Industrial Engine Division, Chrysler Corporation, Trenton, Michigan.

CHRYSLER
INDUSTRIAL

ENGINES
Horsepower With A Pedigree

INDUSTRIAL ENGINE DIVISION
CHRYSLER CORPORATION

BETTER THAN THE BEST BUT PRICED WITH THE LOWEST

SUCCESS

in scores of water-blocked

More than 400 wells have been treated with ATPET 931—and the "batting average" of successful jobs is exceptionally high. Wells that had been given up for dead have been brought back to full production. In other instances, ATPET 931 has helped prevent damage to new wells . . . aided recovery of spent acid in acid jobs.

The following "success stories" are typical

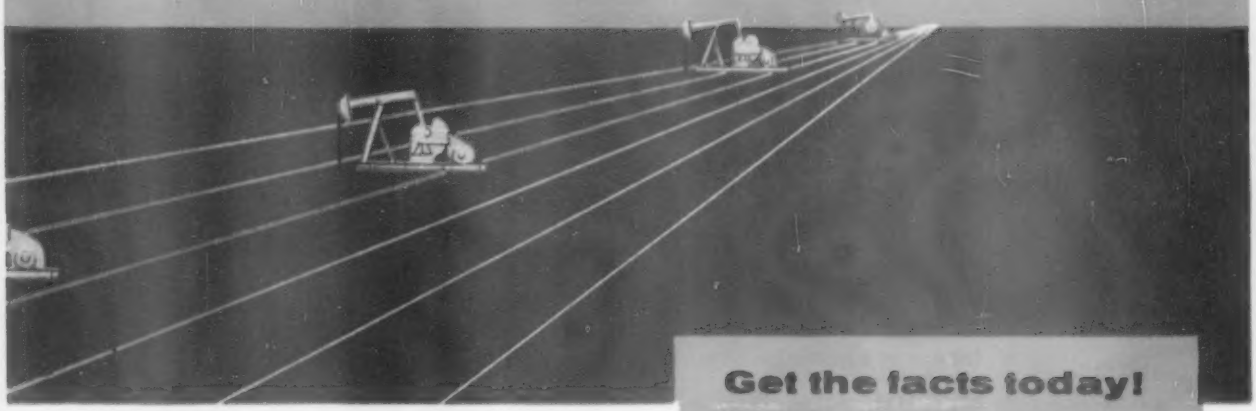
. . . A Gulf Coast well in the Frio sand had been producing 68 BOPD and 204 BWPD flowing when it died. It was treated with 20 gal. ATPET 931 in 20 bbl. oil and is now producing its top allowable of 68 BOPD and 240 BWPD at a 90 psi. T.P.

. . . A West Texas well in the Greyburg formation was producing 12 BOPD and 0 BWPD when it was treated with 5000 gal. crude oil containing 1% ATPET 931. Production was increased immediately to 40 BOPD and 1 BWPD. Four months later, it had gradually increased to 47 BOPD and 4 BWPD.

. . . A West Texas well in the Greyburg formation was producing 39 BOPD and 3 BWPD when it was treated with 5000 gal. crude oil containing 1% ATPET 931. Ten days after the treatment, no production increase was observed and the treatment was considered a failure. However, three months after the workover, production had increased to 59 BOPD and 3 BWPD.

Fast pay-out—In 90 test wells, the average successful treatment paid out in 6 days. Average cost of treatment was under $500. One particularly successful treatment increased production from a show to 116 BOPD.

wells proves value of
ATPET 931



Function-fitted for its job

Created by Atlas, leading producer of surface active agents, and applied by a technique* developed by Stanolind Oil & Gas Company, ATPET 931 has outstanding characteristics.

- Reduces oil-water interfacial tension practically to zero.
- Non-ionic—is not affected by usual brines or acids.
- Does not "plate out" on rock surfaces in the formation.
- Safe for personnel to handle.
- Readily soluble in oil.

*Patent applied for.

Statements concerning the use of Atlas products are not to be construed as recommending the infringement of any patent, and no liability for infringement arising out of any such use is assumed.

Get the facts today!

Plan to try this proved, economical stimulation method in your own wells. Technical data and information is available from Wilmington, Delaware or write your local Atlas office.

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Franklin 2-9530

CHEMICALS DEPARTMENT
ATLAS POWDER COMPANY
WILMINGTON 99, DELAWARE

ATLAS POWDER COMPANY, CANADA, LTD.
BRANTFORD, CANADA

In electrical installations *where QUALITY counts* use CONDULETS*

Quality does count in practically every electrical conduit installation that you make. When you use CONDULETS you know that you are putting in electrical equipment of the highest quality, because CONDULETS have been doubly tested . . . in the factory and in the field.

Crouse-Hinds quality control assures a long-lasting product and field records prove it by the test that only time can give. Thousands of CONDULET installations are still in tip-top condition after twenty, thirty, or even more than forty years of dependable service.

The illustration at the right shows four of Crouse-Hinds' basic quality features that are common to all CONDULETS. The fifth, Wedge Nut Fasteners, is an exclusive Crouse-Hinds feature that has made Obround CONDULETS preferred by electricians everywhere.

Type EVA Explosion-Proof Lighting Fixture

Type ARE Arktite Receptacle Equipment

Type FS Condulet With Pilot Lamp Receptacle, Switch and Plug Receptacle

Type GUAC Explosion-Proof Junction Condulet

1. **Taper tapping.** Condulet threads are taper tapped to match tapered conduit threading. Makes a rigid joint that will not loosen. This assures permanent ground continuity . . . important for safety.
2. **Integral bushing.** A smooth rounded surface protects wire insulation.
3. **Material.** Feraloy . . . a special alloy that is strong and tough, resists corrosion, and gives sharp, full threads
4. **Finish.** A triple treatment provides long-lasting protection . . exceeds Federal and U. L. specifications.
5. **Wedge Nut cover fastener.** Clear cover opening . . . no projections. No loose parts . . . Wedge Nuts and screws self-retained. No screw holes to align.

More than 15000 items are listed in the Condulet Catalog including a complete explosion-proof and dust-tight line for use in hazardous locations.

On your next job, use CONDULETS . . . they're made right to last longer.

**CONDULET is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.*

Type VC Vaportight Industrial Lighting Fixture

Type FLF Explosion-Proof Manual Motor Starting Switch Condulet

Type EPC Explosion-Proof Motor Starter and Circuit Breaker Condulet

CROUSE-HINDS COMPANY
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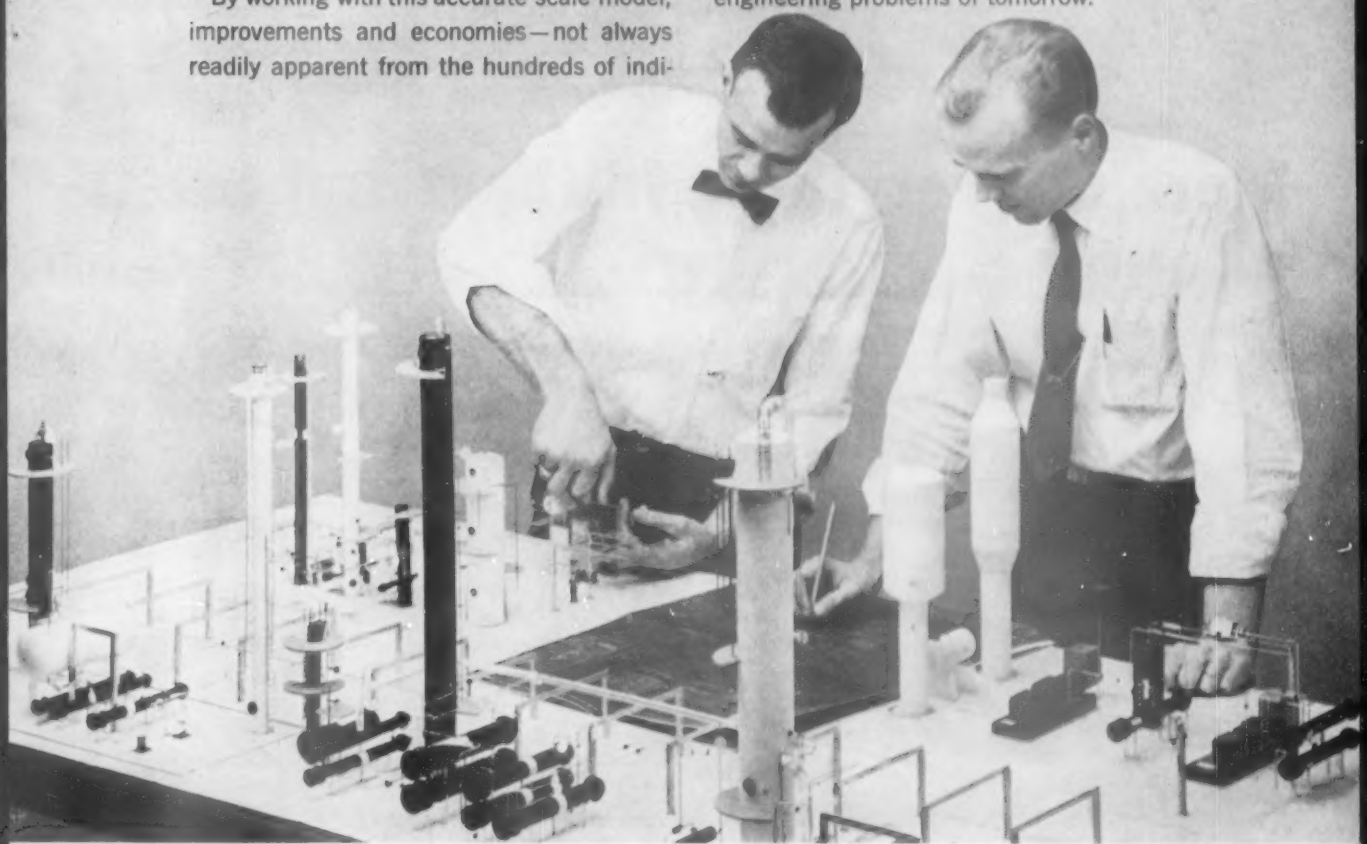
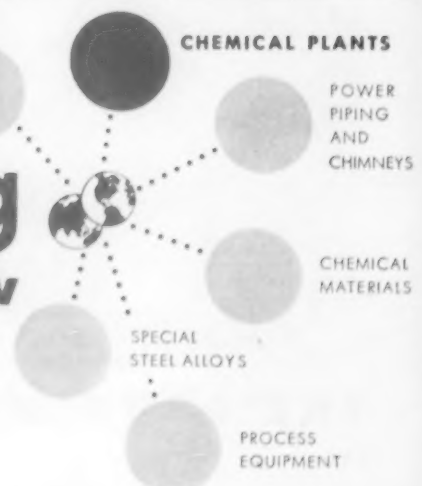
Three-Dimensional Blueprint

This is a very special-purpose model . . . of a new type petrochemical plant now being process engineered and designed by The M. W. Kellogg Company for a major oil company. Built as the engineering progresses, it provides an easy-to-grasp, three-dimensional picture of the miles of complex processing piping . . . the largest and most complicated phase of the construction.

By working with this accurate scale model, improvements and economies—not always readily apparent from the hundreds of individual working drawings of the pipe layout—can be quickly spotted and executed before construction is under way.

If you are considering an investment in petrochemicals, The M. W. Kellogg Company—world's leading designer and builder of petroleum refineries and other complicated processing plants—welcomes the opportunity to show you how it can solve your engineering problems of tomorrow.





M.W. Kellogg

ENGINEERING FOR TOMORROW

THE M. W. KELLOGG COMPANY, NEW YORK 7, N. Y.

The Canadian Kellogg Company, Limited, Toronto • Kellogg International Corporation, London.

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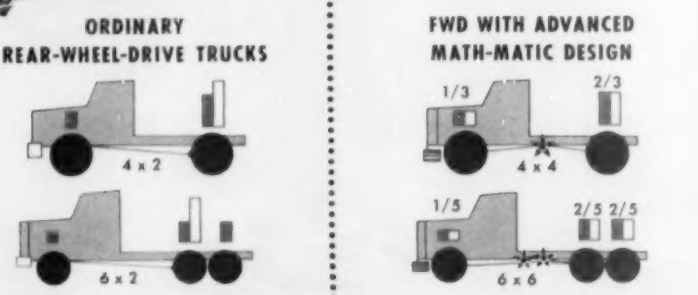
"More than just a Truck—" you want in a

This basic unit of heavy-duty driving power opens up a whole new concept of on-the-job achievement...designed to out-perform mass produced, mass marketed trucks on the basis of extra power, dependability and economy of operation.

More of Everything in these Improved Additions *with Advanced...*

Advanced Math-Matic Design – in every feature of FWD—correctly proportions power to weight on front and rear axles . . . making every pound of load help haul itself! Each wheel's load only makes it grip harder, turning every ounce of power into more controllable traction, greater steering safety.



Note how power is wastefully concentrated on one axle.

Note how power is correctly proportioned to weight distribution.

■ Proportion of weight on each axle

P Proportion of power on each axle

WRITE TODAY . . . for illustrated product folders on units in the weight category you normally use. Four and six wheel drive units from 14,500 to 60,000 lbs. G.V.W.

We'll also send your free copy of "The Truck That Went to College"—report of 7 years' truck research by the University of Wisconsin's College of Engineering.

BUILDERS OF AMERICA'S FWD FOREMOST HEAVY-DUTY TRUCKS

MATH • MATIC DESIGN

THE FOUR WHEEL DRIVE AUTO COMPANY

yet...more of Everything Truck!

★ Higher power-weight ratio!

★ Up to 82% greater tractive ability!

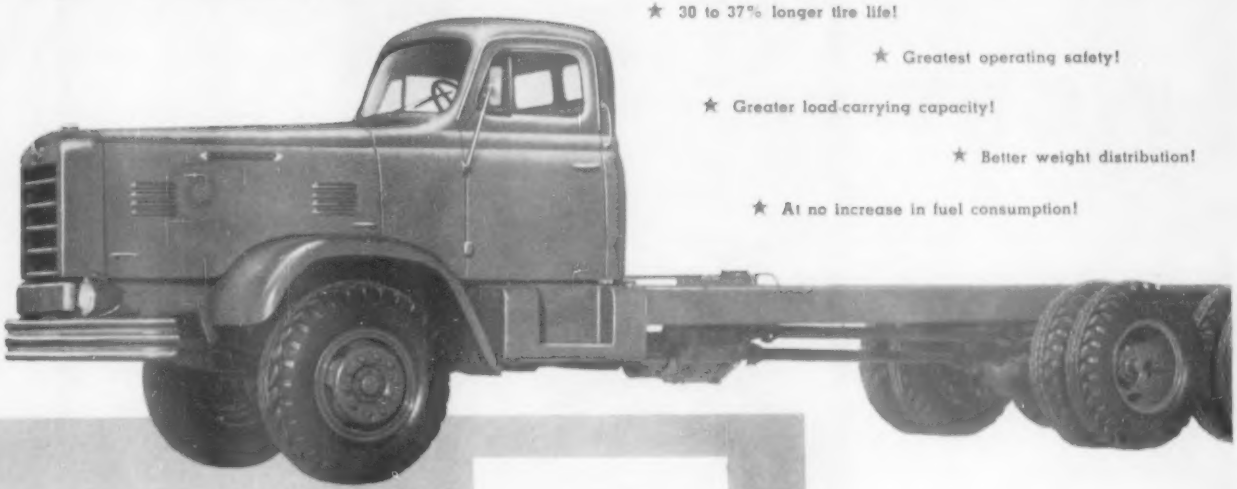
★ 30 to 37% longer tire life!

★ Greatest operating safety!

★ Greater load-carrying capacity!

★ Better weight distribution!

★ At no increase in fuel consumption!

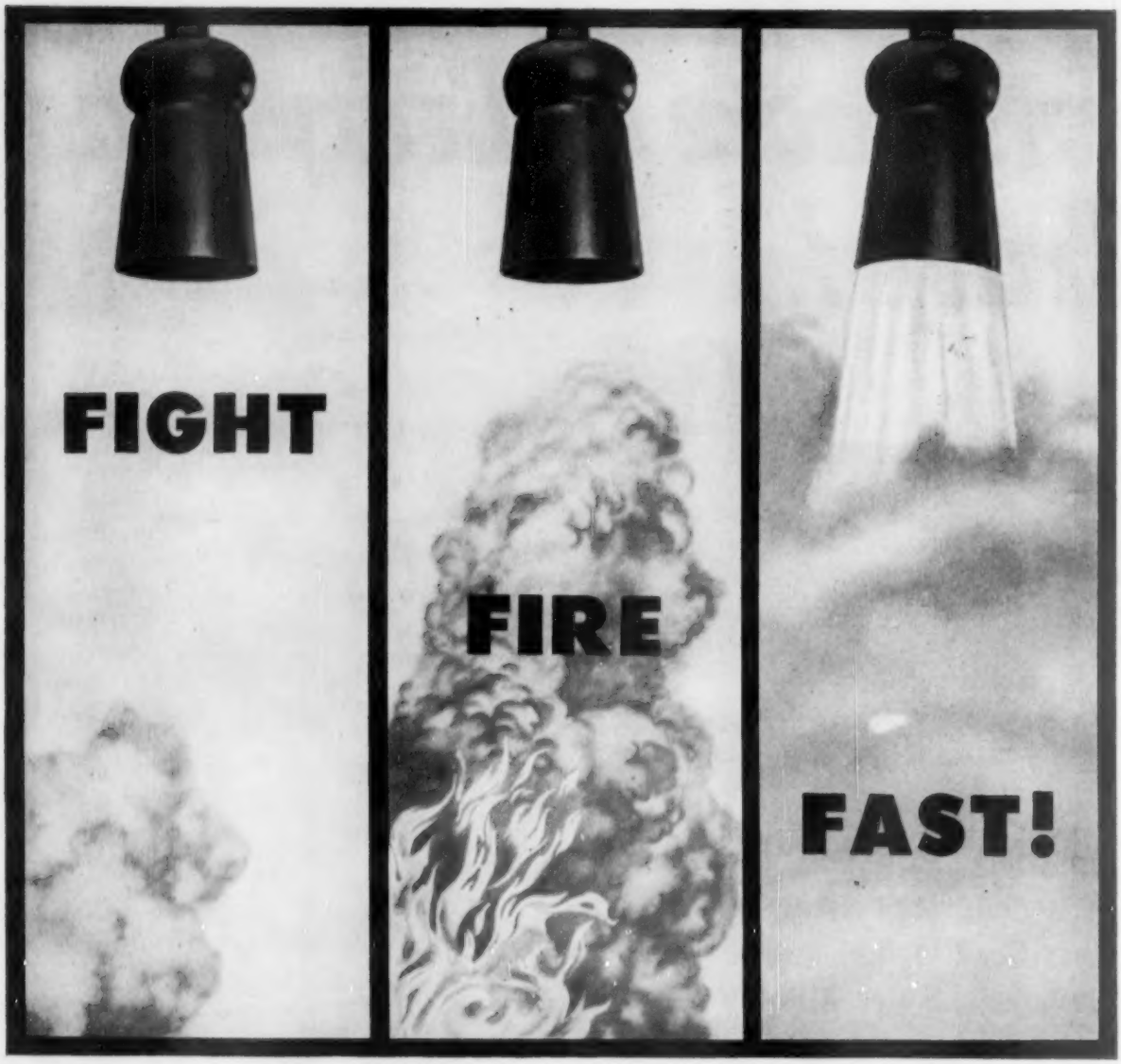


CUSTOM-ENGINEERED ! More Driving Power Less Dead Weight thru Stronger, Lighter Alloy Steels and Advanced Math-Matic Design!

Now—more than ever—more of the weight is working weight in FWDs. New, lighter, tougher steels cut dead weight, increase FWD load-carrying capacity by improving power-weight ratios.

WHAT'S YOUR HEAVY-DUTY TRUCKING PROBLEM?
Along our nation's highways, throughout the world's oil fields, over the rugged terrain utility crews must travel ...anywhere there's tough, heavy work to be done—you'll find FWDs shouldering more than their share of heavy-duty problems. That's what FWDs are for... the tough jobs in tough places, where conventional trucks can't even travel.

CLINTONVILLE, WISCONSIN, *Canadian Factory* KITCHENER, ONTARIO



WITH A KIDDE CO_2 SYSTEM!

Let fire get a foothold, and a going concern is *gone*. Don't risk it. Install a Kidde Automatic CO_2 Fire Extinguishing System, and fire won't stand a chance.

A Kidde System goes into action at the first sign of fire—releases clouds of CO_2 over the blaze, smothers fire almost as soon as it starts. And CO_2 leaves no mess to clean up later. It puts out the fire, then vanishes.

Protect flammable liquids, machinery and electrical equipment with a Kidde System.

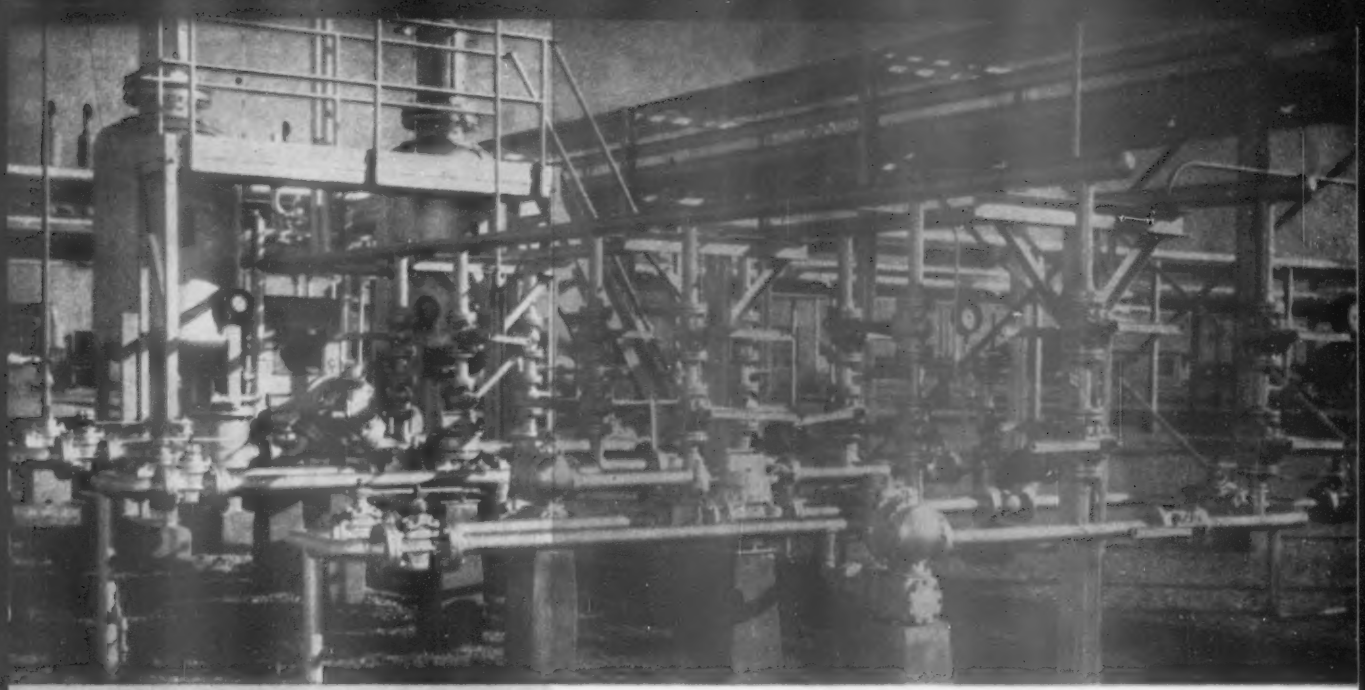
And for on-the-spot protection, get Kidde portables. When fire strikes, just aim the horn, pull the trigger, and *swoosh!* No more fire.

Don't wait 'til your business is a cinder pile—Contact Kidde today.

Kidde (K Kidde)

The words "Kidde", "Lux", "Lux-O-Matic" "Fyre-Freez" and the Kidde seal are trademarks of Walter Kidde & Company, Inc.

Walter Kidde & Company, Inc.
154 Main Street, Belleville 9, New Jersey
Walter Kidde & Company of Canada, Ltd., Montreal—Toronto



Examine the list of analyses. Then, before you choose your new piping or tubing, get in touch with our engineers. In that way, you'll be certain to get the right analysis for your particular requirements. Our recommendations are a service to you, putting you under no obligation.

National Tube's 25 different steel tube analyses:

Carbon	5 Cr, ½ Mo	18-8
Carbon, ½ Mo	5 Cr, ½ Mo, 1½ Si	18-8 Ti
½ Cr, ½ Mo	7 Cr, ½ Mo	18-8 Cb
1 Cr, ½ Mo	9 Cr, ½ Mo	18-8 Mo
1¼ Cr, ½ Mo	9 Cr, 1 Mo	25-20
2 Cr, ½ Mo	9 Cr, 1 Mo	3½ Ni
2¼ Cr, 1 Mo	12 Cr	5 Ni
2½ Cr, ½ Mo, ¾ Si	12 Cr, Al	
3 Cr, 1 Mo	17 Cr	

WALLS WITHOUT WELDS

Refinery Tubing Problems?

We specialize in solving them

● Before you select refinery pipe and tubes, perhaps we can help you in the many problems you must face: basic differences in equipment, variations in fabricating operations, service pressure, high or low temperature conditions, presence of corrosive media, etc. Individually or collectively, all of these factors enter into determination of the best pipe or tube material for your particular service conditions.

You aren't expected to be a tubing expert—it isn't part of your job. It's ours. Our *specialty* is tubing. Through research and laboratory experimentation, through on-the-scene observations, and by studying actual installations, we at National Tube have built up an "experience file"—a collection of case histories that date back through 60 years of solving tubing problems. We want to share this experience with you.

To meet the increasingly more rigorous demands of refinery service, National Pipe and Tubes have been constantly improved until now we are able to offer you seamless tubing, condenser and heat exchanger tubes, and refinery piping in a wide range of analyses—25 of which are listed at the left. Each of these 25 analyses meets the specific requirements of corrosion and oxidation for which it is recommended. Other chemical compositions are also available in tubular products, and a wide variety of high temperature problems are now under study.

NATIONAL TUBE DIVISION,
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS NATIONAL SEAMLESS PIPE AND TUBES

USS

UNITED STATES STEEL

POWELL VALVES . . . THE COMPLETE QUALITY LINE . . . POWELL VALVES

. . . THE COMPLETE QUALITY LINE . . . POWELL VALVES . . . THE COMPLETE QUALITY LINE . . .

POWELL LUBRICATED PLUG VALVES

FIG. 3059G—300-Pound Steel Flanged End Valve. Sizes 6" to 12".

FIG. 1559—150-Pound Steel Flanged End Valve. Sizes 1" to 4".

. . . THE COMPLETE QUALITY LINE . . . POWELL VALVES . . . THE COMPLETE QUALITY LINE . . .

POWELL VALVES . . . THE COMPLETE QUALITY LINE . . . POWELL VALVES

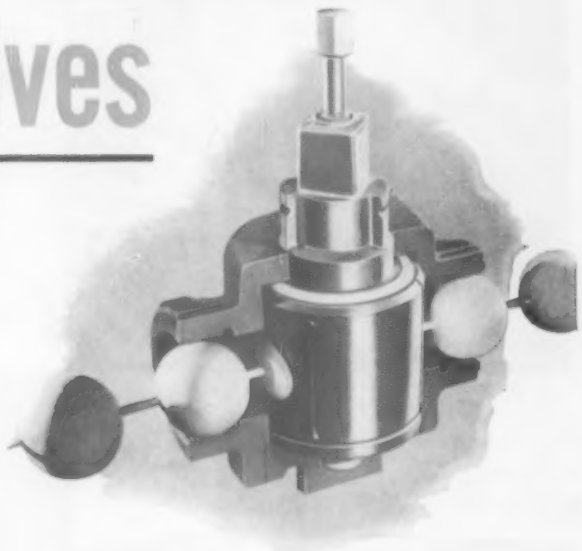
Powell Valves—the *complete* quality line—offer many outstanding features in these new Lubricated Plug Valves, such as quick and sure operation and a positive seal when the valve is closed.

Valves are available with screwed or flanged ends; single, screwed and bolted gland types, and in Semi-Steel, Carbon Steel, Bronze, Ni-Resist, Monel Metal, and Stainless Steel. Semi-Steel valves are rated 175 and 200 pounds W.O.G.; Steel valves, 150 and 300 pounds W.P. Sizes from 1" to 12". Valves in sizes 6" and larger can be furnished with gears for gear operation. Distributors located in principal cities. For descriptive literature—or help on valve problems—write direct to

The Wm. Powell Company, Cincinnati 22, Ohio ..... 109TH year

THE "HOLE" TRUTH

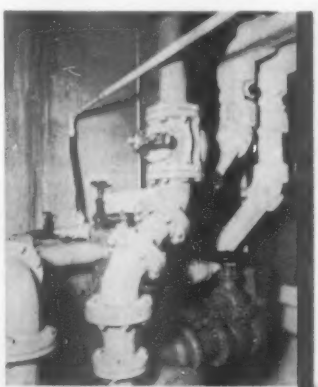
ABOUT round port plug valves



The truth is: no other opening will give you the flow perfection of a round hole! Because acf Round Port Valves are the exact size and shape as the pipe itself...you get smooth, unrestricted flow of even the most heavy viscous ladings. There are no obstructions...no loss in head pressure...no turbulence and harmful abrasive effects from solids in suspension.

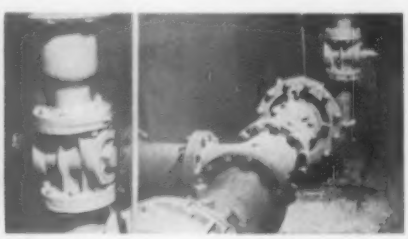
Quarter-turn shut off! Full pipe area opening! Non-wedging design! All these features are found in *both* acf Round Port Valves and Rectangular Port Valves. Their extra long service life with minimum maintenance will save you money in the long run. And that's the truth!

Representatives in 50 Principal Cities. Write for descriptive Catalog 5-OG, acf Industries, Incorporated, Valve Division, 1501 E. Ferry Avenue, Detroit 11, Michigan.



In Sewage treatment

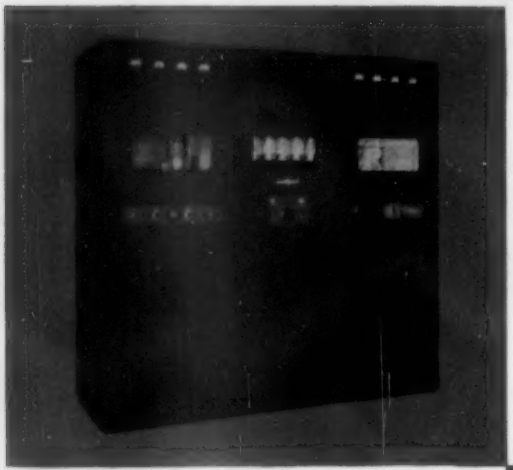
In Steel Plants



In the Cement Industry

acf CYLINDRICAL FULL PIPE AREA PLUG VALVES

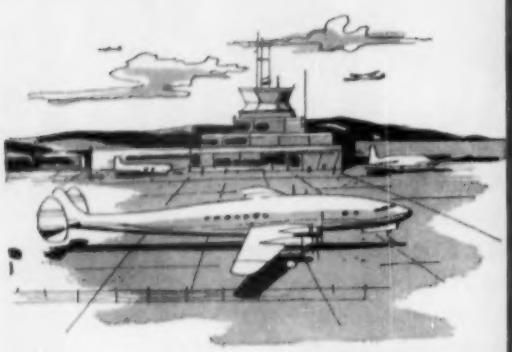
Collins RADIO COMMUNICATION TRANSMITTERS for MAXIMUM RELIABILITY

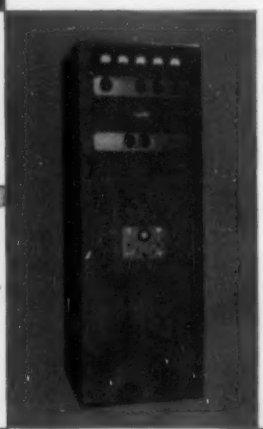


Proven equipment with wide frequency range and high performance for point-to-point or ground-to-plane applications requiring dependable operation on one or more channels.

COLLINS 231D-20

The latest model of a long series of high powered Autotune transmitters which have found application all over the world. 5000/2500 watt r-f output. It provides ten selectable crystal controlled channels within the range 3 to 26 mc. Channel change is accomplished by means of a regular telephone type dial, either locally or at a remote point. Power to insure communication over the long point-to-point or ground-to-air routes is provided.



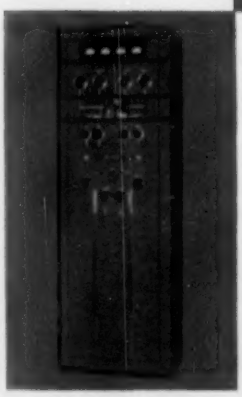


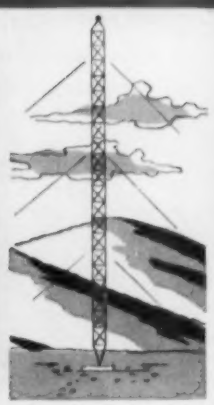
COLLINS 16F-14

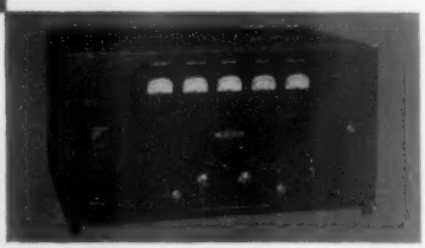
Power output of 300 watts voice, 500 watts CW. Frequency range 2 to 20 megacycles. The Collins Autotune provides rapid and precise frequency change and sets up the 16F-14 for operation on any one of ten pre-tuned frequencies. May be operated at the front panel or by a remote control unit from distances up to 25 miles. A single cabinet houses the complete transmitter.

COLLINS 30K-5

Provides two transmitting channels within the range of 2 to 30 megacycles. 250 watts voice, 300 watts CW up to 15 mc and slightly reduced output at higher frequencies. Local or remote control. Instantaneous frequency change.







COLLINS 32RA

50 watts voice, 75 watts CW. Any of four pre-tuned frequencies within the range 1.5 to 15 megacycles. Completely self-contained, including power supply. 115 volt a-c power source.

Write for descriptive literature

COLLINS RADIO COMPANY
Cedar Rapids, Iowa

261 Madison Ave., NEW YORK 16
1930 Hi-Line Dr., DALLAS 2
2700 W. Olive Ave., BURBANK
Collins Radio Company of Canada Ltd, 74 Sparks Street, OTTAWA, ONTARIO

COLLINS

MEET MR. INDEPENDENT—

It's better business to buy more from him!

When it comes to selection, you can count on your independent distributor to give you the best products at the best prices and deliver them when and where you want them.

Being free to pick and choose the items he sells, he naturally carries only the kind of equipment and other products that are capable of delivering results . . . for example, the Pittsburgh Seamless drill pipe, tubing and casing carried by the 19 independent distributors listed at right.

It costs no more to do business with your independent distributor. Because of his location, low overhead, and efficient methods of operation you can expect him to offer competitive prices for quality goods. That's why he's in business and growing larger every year.

Mr. Independent makes every effort to carry in stock the items most popular in a particular field. He is a local man who knows local conditions. He knows what oil men want and strives to do business your way on a more personal basis. Rules are more flexible. There is no remote control with Mr. Independent. The local store manager, even the salesman, can answer your questions promptly without delays and red tape.

Yet your distributor is backed by long-experienced steel manufacturing know-how. Next time you need seamless drill pipe, casing or tubing, give one of these men a ring and specify Pittsburgh Seamless. You'll find him always eager to help you with your problems . . . in fact, you'll find it's just better business to buy *more* from him.

For Fast, Personal Service

—these independent distributors who carry Pittsburgh Seamless drill pipe, oil well tubing, and casing are ready to meet your requirements.

Bradford Supply Company
Home Office
130 Main Street
Bradford, Pennsylvania

Buckeye Supply Company
18 Harrison Street
Zanesville, Ohio

C. W. Cotton Supply Company
Utica National Bank Building
Tulsa 5, Oklahoma

Franklin Supply Company
624 South Michigan Avenue
Chicago 5, Illinois

Houston Oil Field Material Co.
1524 Maury Street
Houston, Texas

Industrial Supply Company
500 Eighth Street
Wichita Falls, Texas

Iverson Supply Company
400 West Fifth Street
Tulsa, Oklahoma

Lucey Export Corp.
233 Broadway
New York 7, New York

Lucey Products Corp.
624 South Cheyenne
Tulsa 5, Oklahoma

McJunkin Corporation
P. O. Box 513
Charleston 22, West Virginia

Midland Supply Company
Box 3105
Washington St. Station
Wichita 7, Kansas

Mountain Iron & Supply Co.
100 Rule Building
Wichita 2, Kansas

Murray Brooks, Incorporated
P. O. Box 855
Lake Charles, Louisiana

Norvell Wilder Supply Company
P. O. Box 4145
Beaumont, Texas

Producers Supply & Tool Co.
706 Commercial Standard Bldg.
Fort Worth 2, Texas

Rodman Supply Company
P. O. Box 2752
Odessa, Texas

Southwest Supply Company
1720 Oliver Building
Pittsburgh, Pennsylvania

Superior Iron Works & Supply Co.
P. O. Box 1800
Shreveport, Louisiana

Western Supply Company
424 North Boulder Avenue
Tulsa 1, Oklahoma

Pittsburgh Seamless Oil Country Goods . . . *a product of*

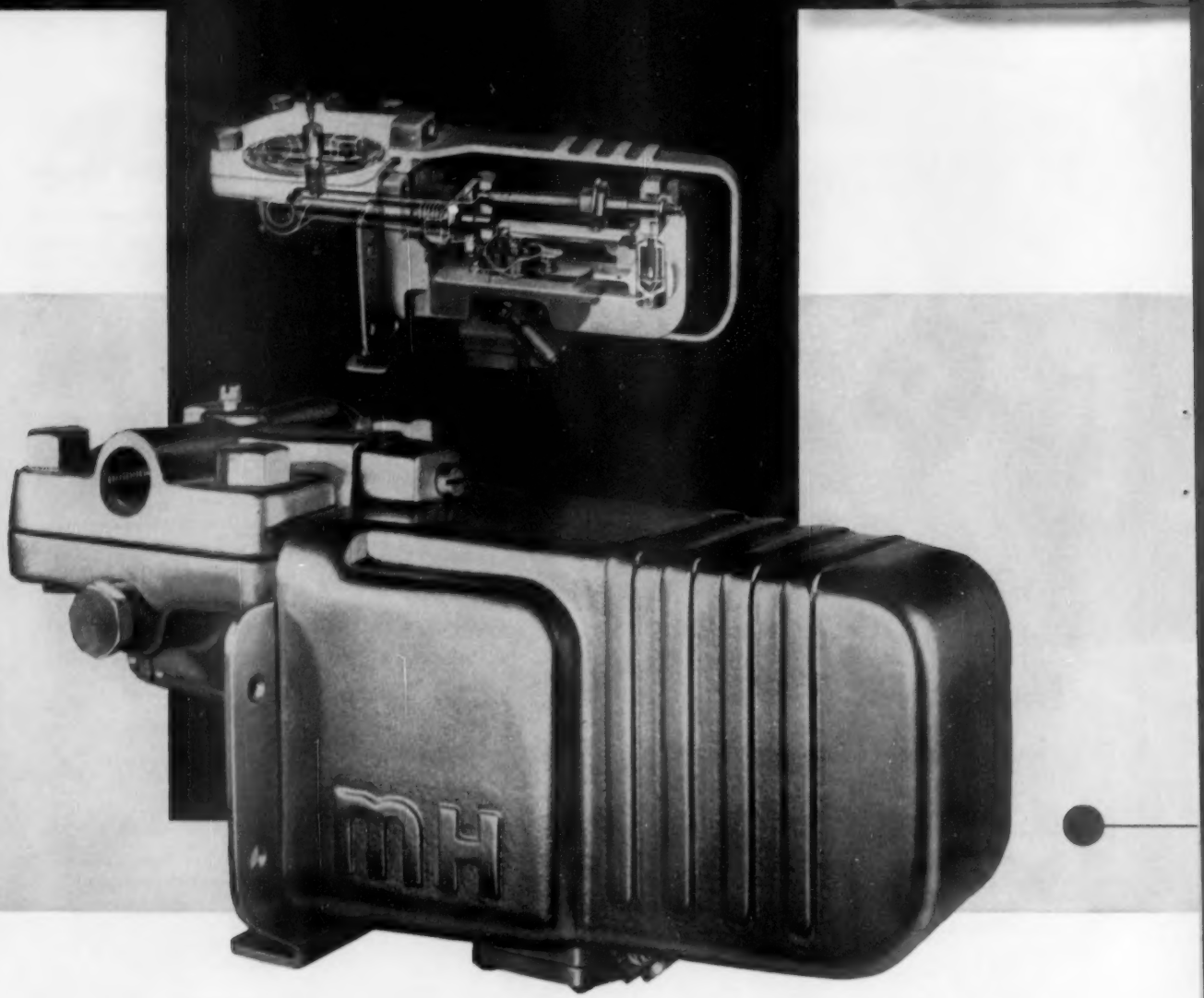
Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pennsylvania

DISTRICT SALES OFFICES: Atlanta • Chicago • Cleveland • Columbus • Dallas • Dayton • Detroit Houston • Los Angeles • New York • Philadelphia • Pittsburgh • San Francisco • Tulsa • Warren, Ohio.

PLANTS: Monessen, Pa. • Allenport, Pa. • Akron • Los Angeles • Unionville, Conn. • Warren, Ohio • Worcester, Mass.

PRINCIPAL PRODUCTS: Hot and Cold Rolled Strip and Sheets • Strip Specialties • Seamless Tubular Products • Wire and Wire Products • Chain-Link Fence • Cargotainers • Steeltex



Every feature your application requires!

CONTINUOUSLY ADJUSTABLE RANGE
Easy field adjustment of range from 0-20 to 0-200 inches of water.

SIMPLE DESIGN
Uses no mercury . . . has few moving parts . . . practically no maintenance.

SIMPLE FIELD CALIBRATION
Check with weights in minutes . . . no curves or tables. 1 lb.=10″ water.

LOW AIR CONSUMPTION
Model with pilot relay uses only 0.05 cfm of air.

HIGH SPEED
Practically instantaneous response to changes in flow or level.

HIGH TEMPERATURES
Withstands fluid temperatures up to 350°F . . . ambient temperatures to 225°F.

RESISTS CORROSION
Teflon diaphragm and stainless steel meter body eliminate usual need for seals or purges.

EASY INSTALLATION
Compact, lightweight unit is easily mounted anywhere.

● ***Plus these new features for liquid level measurements:***

LOWER RANGES
Extended down to 0-14 inches of water for liquid level applications.

VERSATILE CALIBRATION
Direct-reading scale, with up to 100% suppression of calibrated range.

Pace-setting performance for flow measurements— *now for liquid level, too!*

the Honeywell **Differential Converter**

THE remote transmitter that has set new standards of performance in flow applications—the Honeywell Differential Converter—is now available in a new model for liquid level measurements in closed vessels. Suitable for use with either pressure or vacuum vessels, this model offers all the features of fast response, precision, convenience and ruggedness that have earned the Differential Converter wide acceptance throughout industry. The line now covers practically *any* flow or liquid level measurement.

This versatile pneumatic transmitter uses no mercury. It can be used in scores of installations where contamination problems have long impeded measurement. Operating on the force-balance principle, it provides exceptional precision and high-speed response . . . makes possible closer control in the most critical applications.

The ideal companion for Honeywell *Tel-O-Set* miniature indicators, recorders and controllers, the Differential Converter can transmit to any of a variety of Honeywell instruments.

Whenever you have a flow or liquid level measuring problem, you'll find the Differential Converter offers you the top in performance and serviceability. Your nearby Honeywell sales engineer will be glad to discuss your requirements in detail. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Penna.

● REFERENCE DATA: Write for Bulletin 2291, "Differential Converter Liquid Level Transmitter", and for Bulletin 1160, "Measuring and Controlling Liquid Level."

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

First in Controls

Blanketed Base Pans and Automatic Sentries Push Service Dates Apart

Service dates skip months instead of days where operators have Minneapolis-Moline long-run oil field engines. MM exclusive water-jacket base pan with large built-in filters keep engine and lube oil at constant temperature under any load or weather condition.

Automatic control of crankcase temperature prevents sludging and enables more effective filtering. The high efficiency of MM exclusive vacuum crankcase ventilation is obtained by blanketing the base pan with engine water. This holds crankcase vapor above the dew point so that (instead of condensing and forming sludge) it is withdrawn.

Added advantages of MM long-run design are extra large permanently lubricated bearings, sealed pressure cooling with water by-pass and thermostat control, built-in oil-flow controllers and automatic sentries —safety cutouts that prevent damage in case of low oil pressure or excessive water temperature.

For complete facts and specifications on lowest cost and most dependable power in the oil fields phone

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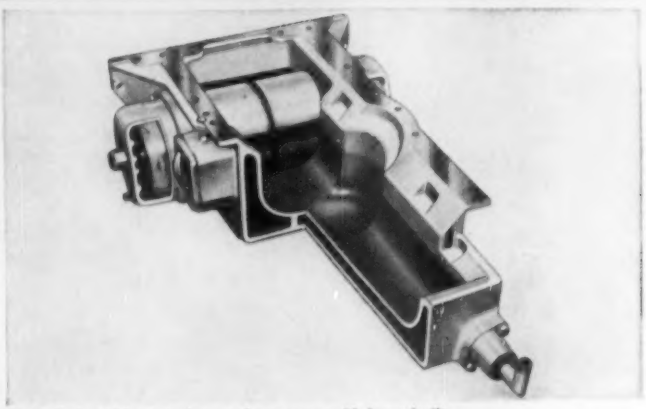
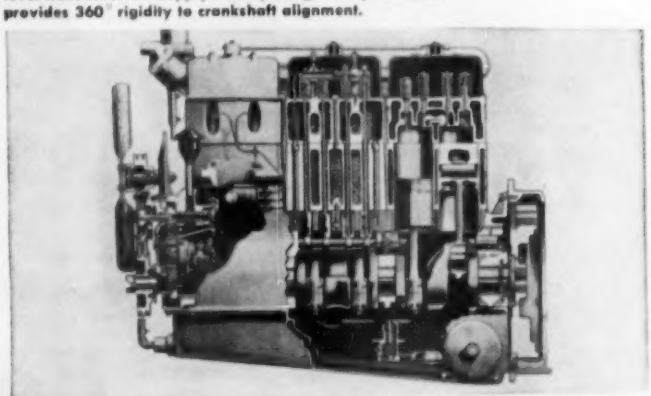
Twenty Years of Oil Field Engine Application at Your Service

INDUSTRIAL DIVISION

MINNEAPOLIS-MOLINE
MINNEAPOLIS 1, MINNESOTA



Water-jacketed heat exchanger base pans with large built-in filters provide automatic thermostatic control of lube oil temperature. Oil flow controller maintains constant oil level from reservoir supply. Heavy flange on flywheel end provides 360° rigidity to crankshaft alignment.



Engine cross-section shows how MM cooling maintains the entire engine at a constant temperature. Variation maximum is 4° to 5°. Automatic thermostatic control and by-pass system act as heater or cooler—engine runs at constant temperature under all operating conditions.

Pipe and tool joints are forged as one

J&L INTEGRAL JOINT SEAMLESS DRILL PIPE

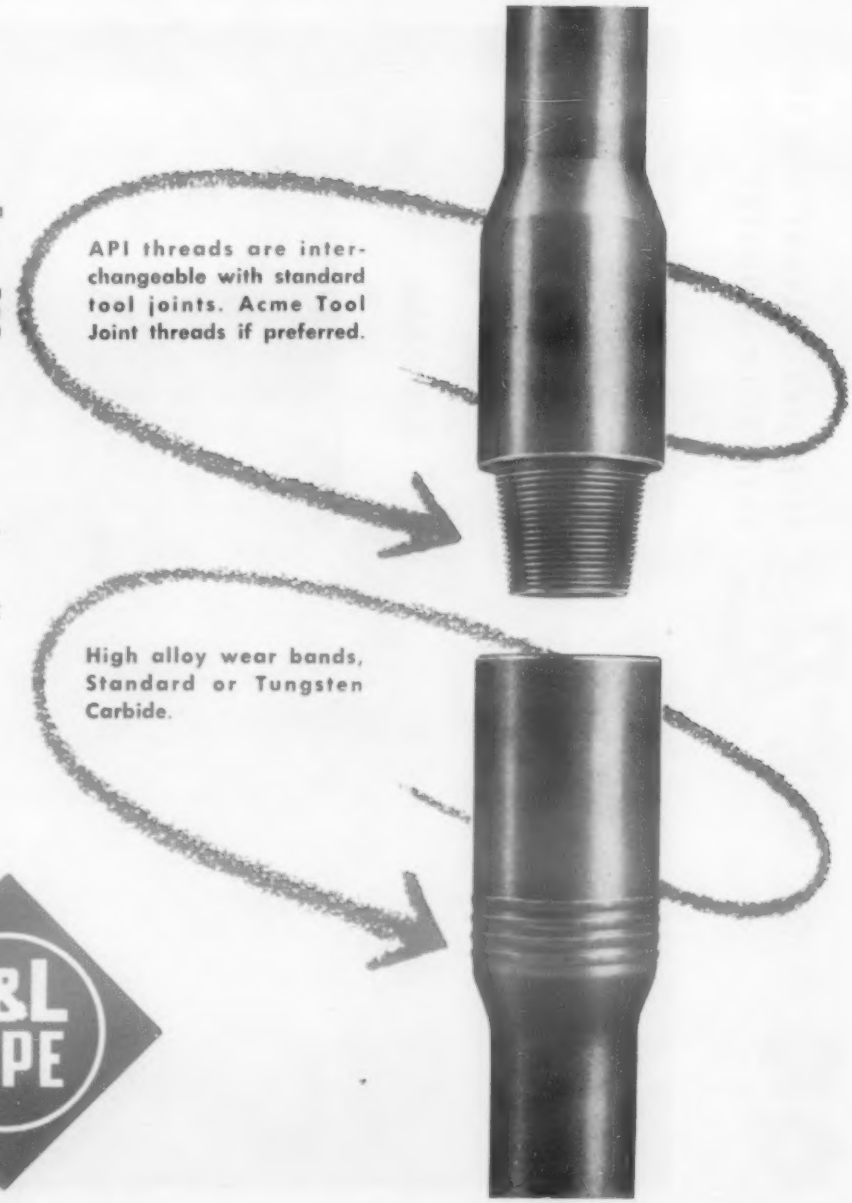
J&L Integral Joint Drill Pipe is made of J&L Blue Ribbon Steel.

Blue Ribbon is the culmination of years of Jones & Laughlin leadership in the manufacture of quality steels.

In producing J&L Integral Joint Blue Ribbon Drill Pipe the steel is made, rolled, formed, forged, heat treated and finished for the man who wants a truly rugged string of drill pipe and tool joints.

Full hole or internal flush design. API or Acme Tool Joint threads. Box and pin ends available with O.D. slightly greater than API standard.

Ask any J&L man for further details.

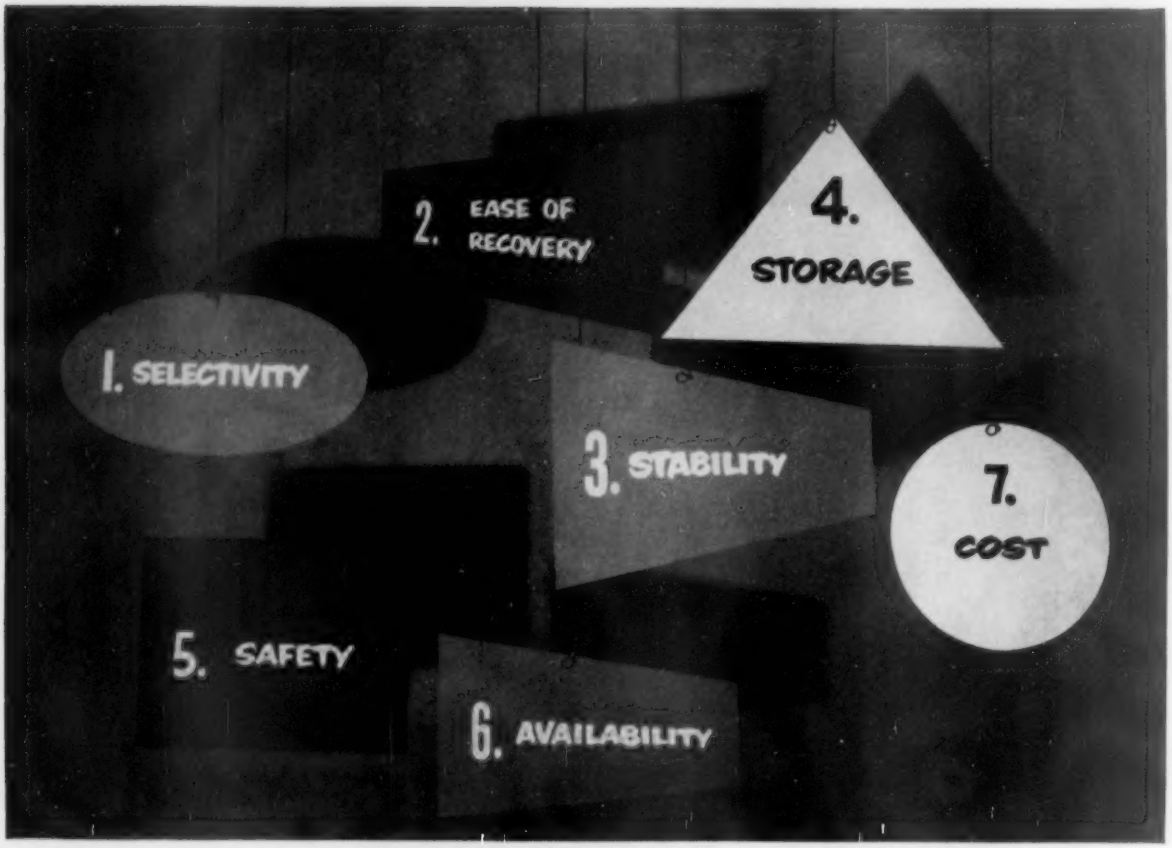

API threads are interchangeable with standard tool joints. Acme Tool Joint threads if preferred.
High alloy wear bands, Standard or Tungsten Carbide.

Jones & Laughlin
STEEL CORPORATION
SUPPLY DIVISION – TULSA, OKLAHOMA
Serving The United States and Canada

J&L PIPE

No. 105-S

QO FURFURAL, *The* SELECTIVE SOLVENT FOR THE PETROLEUM INDUSTRY



What Makes Furfural So Good?

1. SELECTIVITY: Furfural is highly selective; it is a polar molecule and gives a sharp separation. Its high specific gravity permits rapid phase separation.

2. EASE OF RECOVERY: Furfural is a stable compound and may be readily recovered from aqueous solutions by steam stripping; it may be recovered from non-aqueous solutions either by flash vaporization, straight distillation, steam stripping, or extraction with water.

3. STABILITY: Under the conditions encountered in refining furfural has a high degree of stability as shown by the low solvent losses in operating plants around the world.

4. STORAGE: It is not necessary to use special handling precautions for cold weather since furfural has a low freezing point of —34°F. which is well below temperatures normally encountered. Generally, furfural is stored and handled in steel tanks and lines.

5. SAFETY: Furfural has a safety record extending over 30 years of industrial use. It has a high flash point (150-160°F.) and a vapor pressure of 8 mm. Hg at 39.9°C.

6. AVAILABILITY: Large quantities of furfural are produced the year around at three plants from raw materials which are replaceable annually.

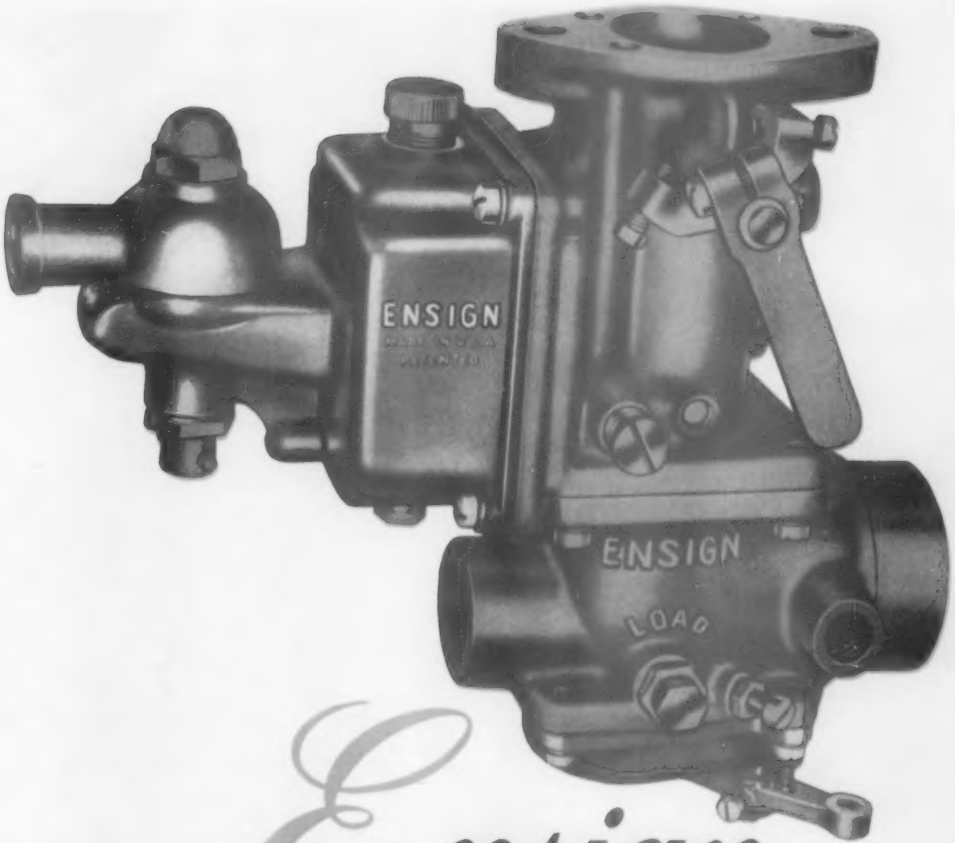
7. COST: Furfural is low in price, and with high recovery, over-all solvent costs are attractively low.

If you would like to know more about the properties of furfural, write for our Bulletin 203 "Physical Data on Furfural."

The Quaker Oats Company CHEMICALS DEPT.

3397 The Merchandise Mart, Chicago 54, Illinois
Room 3397, 120 Wall St., New York 5, N. Y.
Room 4397, P. O. Box 4376, Portland 8, Oregon

In the United Kingdom: Imperial Chemical Industries Ltd., Billingham, England
In Europe: Quaker Oats-Graanproducten N. V., Rotterdam, The Netherlands; Quaker Oats (France) S. A., 3, Rue Pillet-Will, Paris IX, France
In Australia: Swift & Company, Pty., Ltd., Sydney • In Japan: F. Kanematsu & Company Ltd., Tokyo

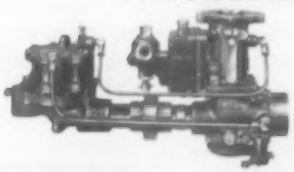


there's this about Ensign

Why is it that on over 95% of all gas engines you'll find ENSIGN carburetors? The man in the field is largely responsible for this phenomenal acceptance. On his shoulders rest the responsibility for dependable uninterrupted gas engine performance. And to him engine and oil equipment builders look for actual field proof of good carburetor performance. By reducing engine failures to a minimum, ENSIGN has helped this man do his job well and efficiently.

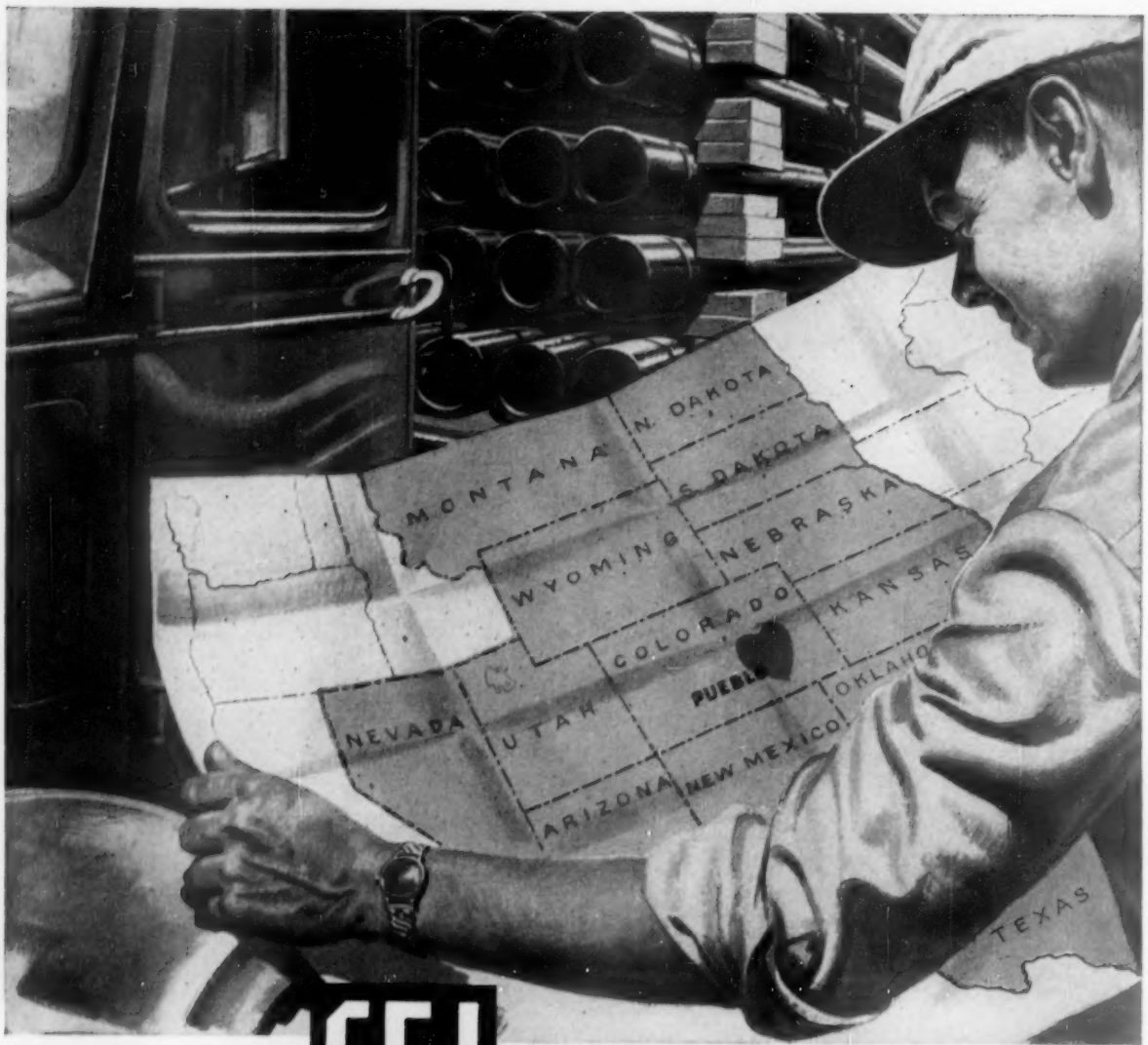
Yes, there's this about ENSIGN. You expect good PERFORMANCE – you get good PERFORMANCE.

WORLD WIDE ACCEPTANCE



ENSIGN CARBURETOR COMPANY

7010 S. Alameda St., Box 229, Huntington Park, Calif.
Branch Factory, 2330 W. 58th St., Chicago 36, Illinois



THE NEW CF&I SEAMLESS TUBE MILL

set in the heartland of the oil country

Here at Pueblo, Colorado, stands the new C F & I Seamless Tube Mill — strategically located in the heartland of the Western oil country to give prompt on-the-spot attention to the needs of oil and gas companies in the Rocky Mountain and Southwest areas.

The new C F & I Seamless Tube Mill is the newest mill of its kind West of the Mississippi. To all members of the petroleum industry we extend a cordial invitation to inspect the modern facilities and advanced inspection techniques which now assure you of casing and tubing that are tops for precision and quality.

C F & I Seamless Oil Country Casing and Tubing meet API STD 5A specification and are available in sizes from 2 3/8" O.D. through 9 5/8" O.D.

2465

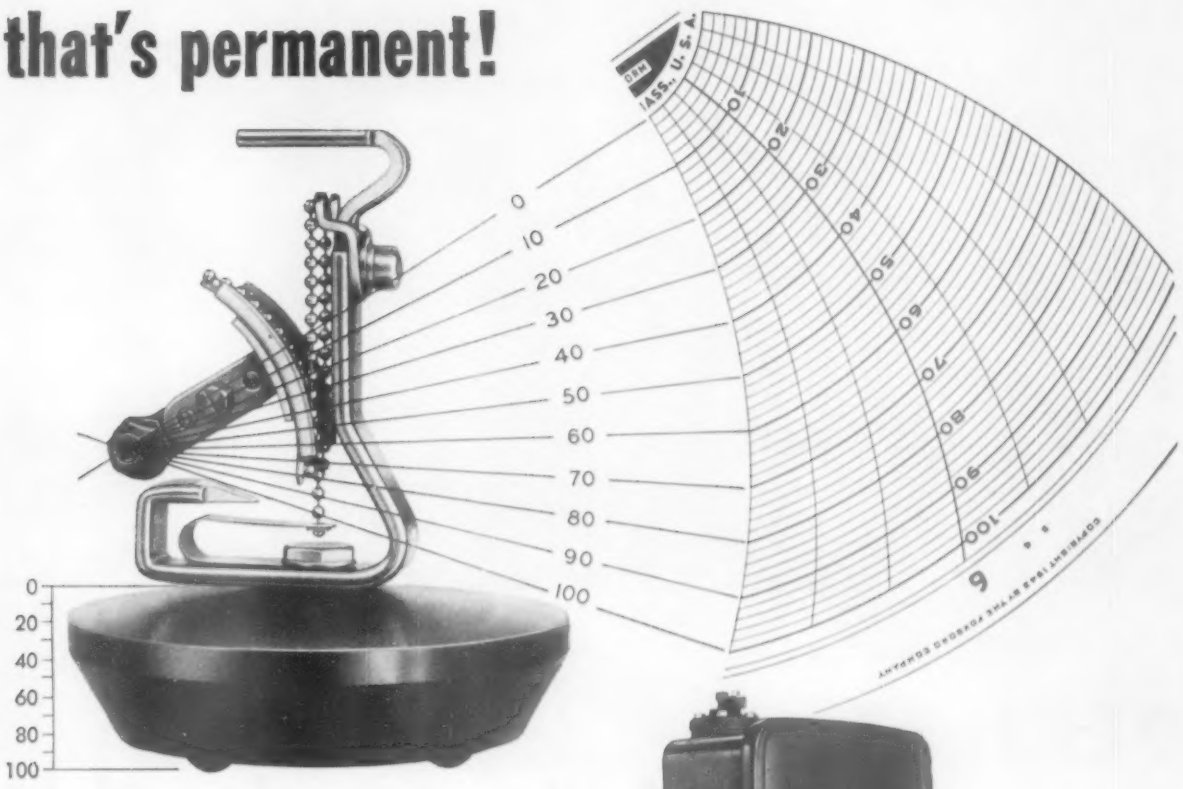
CF&I TUBULAR PRODUCTS

THE COLORADO FUEL AND IRON CORPORATION

DENVER, COLORADO

CF&I

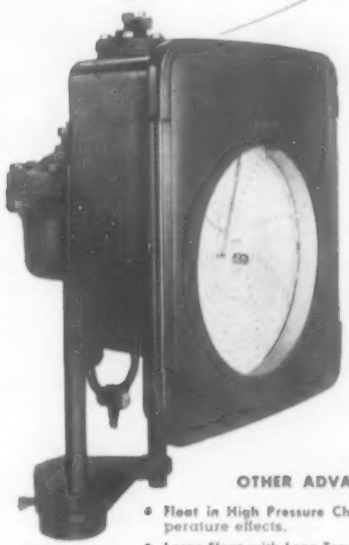
Full-scale meter accuracy that's permanent!



Exclusive Segmental Lever Design Gives Linear Transmission from Float to Pen Point . . . No Angularity Errors

A basic-design feature of Foxboro Flow Meters insures permanent calibration at all readings on the scale, by eliminating angularity errors and lost motion. The exclusive Segmental Lever drive transmits vertical motion of the float to the pen in positive, linear relationship. Its stainless steel ball chain runs free and true, regardless of meter alignment.

This is only one of several better-engineered features that have made Foxboro Flow Meters the unqualified choice of industries wherever dependability and "cash-register" accuracy of metering are important. Available in rectangular and circular case models. Write for complete story in Bulletin 460. **The Foxboro Company, 601 Neponset Avenue, Foxboro, Massachusetts, U.S.A.**



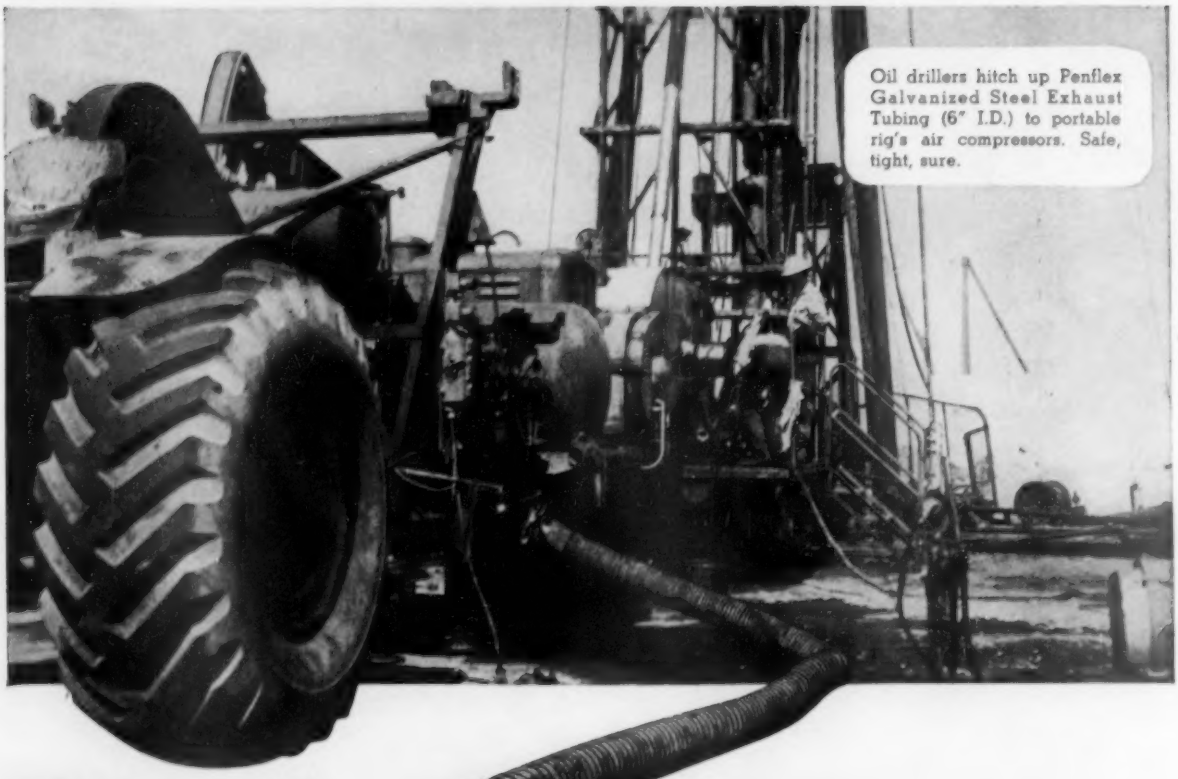
OTHER ADVANCED FEATURES

- **Float in High Pressure Chamber** minimizes ambient temperature effects.
- **Large Float with Long Travel** gives high-power pen drive.
- **Sure-Seal Check Floats** with positive-seating ball plugs submerged in mercury prevent sticking, leaking, corrosion. Will not blow mercury.
- **Pressure Seal Bearing** is friction-free, completely leak-proof, interchangeable. No stuffing box. No lubricator.
- **Self-aligning, Union-Coupled U-Bend** — No gaskets. Fully-adjustable plug gives calibrated damping, directed drain.

OVER 100,000 FOXBORO FLOW METERS WITH SEGMENTAL LEVER ARE IN USE TODAY

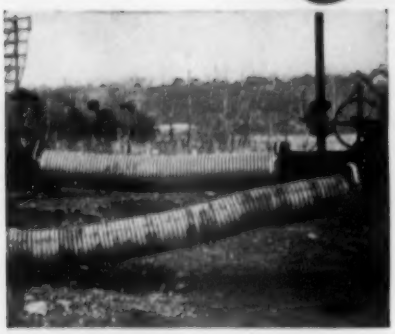
FOXBORO REG. U. S. PAT. OFF. — First in FLOW METERS

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND



Oil drillers hitch up Penflex Galvanized Steel Exhaust Tubing (6" I.D.) to portable rig's air compressors. Safe, tight, sure.

PENFLEX holds air, gas, volatiles, granulars tight



Huge oil storage tank "walks" with the weather thanks to Penflex four-wall Interlocked Tubing of Galvanized Steel (12" I.D.), and tight-packed flanges.

Exhaust gases sneak through ordinary flexible hose—but not through Penflex. Its four-wall interlocking design, with or without packing, holds tightly whatever you convey . . . gases, liquids or granulars.

Penflex has hundreds of applications in the oil and gas fields and a complete tubing assembly specific to each. Drilling, for example, illustrated above. Pipeline laying . . . where Penflex pipes hot tar and asphalt from heater to painting and wrapping machine. Processing . . . where Penflex seals pipe joint assemblies on petroleum still burners. Storage . . . where Penflex provides flexible but leakproof connections for huge tanks. The list of applications is lengthening daily.

Write for "Flexineering", your guide in buying and using Penflex Interlocking and Corrugated Tubing, and Penflexweld, the High-pressure Tubing for service where leaks are fatal. No charge or obligation.

Pennsylvania Flexible Metallic Tubing Company, Inc., 7213 Powers Lane, Phila. 42, Pa.
Branch Sales Offices: **Boston • New York • Chicago • Houston • Cleveland • Los Angeles and Distributors in Principal Cities**

COMBINES FLEXIBILITY WITH DURABILITY

World's largest supply service—to serve you best!

Behind every piece of equipment or supply item you purchase at the local National Supply Store, there's a complete record of modern, efficient distribution practices at work.

To get slush pump parts, pipe and nipples . . . or spark plugs, V-belts, and bearings to you requires a large, fast-moving organization. This organization calls for the coordinated efforts of traffic men, purchasing specialists, inventory and distribution control men and expediters. Since our "one-store" beginning back in 1887, we have learned that it takes such a large organization to give you a consistent quality of supply service—and make it readily available wherever you are operating.

It also takes this kind of large, experienced organization to assure a brand of specialized supply service that is tailored to your own local needs.

Your preference for this service has made National Supply's international organization of 124 stores the world's largest oil industry supply service. It has also made possible the fact that wherever you are—the U.S., Canada, South America or anywhere in the world where oil is produced—there's a National Supply man ready to serve you best.

First in quality
First in supply service
in oil country everywhere

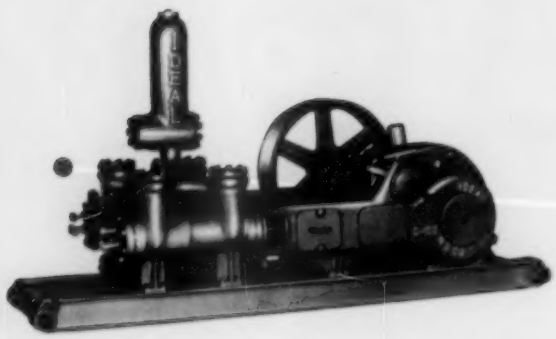
NATIONAL BLUE PRODUCTS

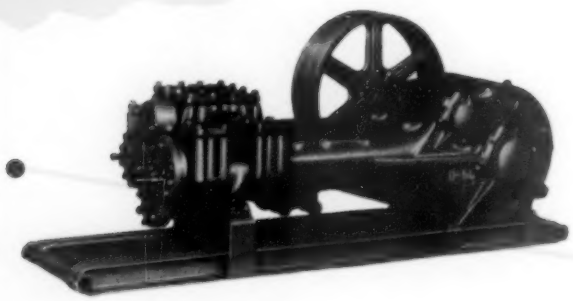
THE
NATIONAL SUPPLY
COMPANY

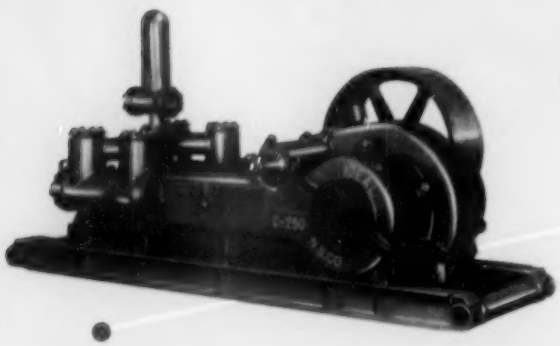
PITTSBURGH 30, PENNSYLVANIA

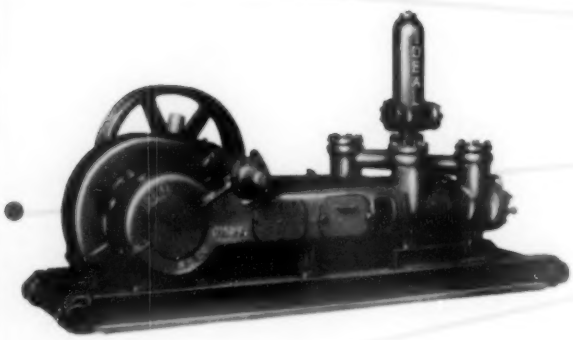
There's extra performance for all of your drilling jobs in these

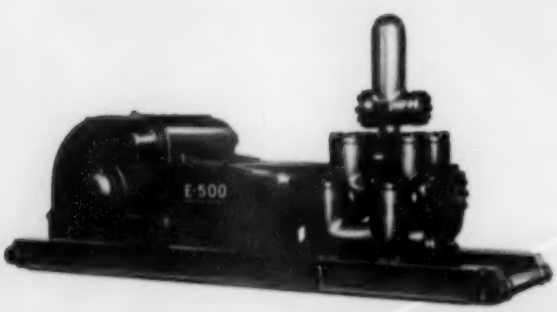
IDEAL Slush Pumps

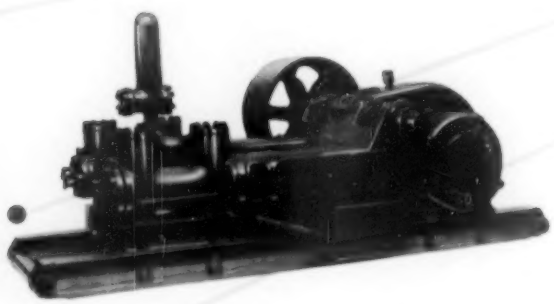


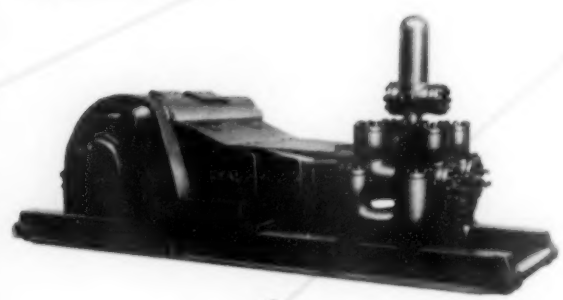












National Supply's 40-year history and experience in mud pump design and construction means that all field-tested improvements become part of Ideal Power Slush Pumps—for round-the-clock performance you can count on.

Operators depend on these outstanding Ideal Slush Pump advantages

Ruggedly built for maximum service life under a great variety of drilling conditions. Finest quality metals are used throughout for long wear, and advanced design provides greater pump strength.

Pre-loaded main bearings in Ideal Slush Pumps, independent of the frame, assure maximum pump life under varying conditions. Each Ideal Pump model, too, is consistently and proportionately rated for long-life performance in its given operating range.

A model for every drilling job. The complete Ideal Power Slush Pump line ranges from 80 to 1000 horsepower input to suit every drilling requirement, including jet drilling.

Get the up-to-date facts on Ideal Power Slush Pumps by asking for recently published bulletins at the nearby National Supply Store.

TYPE	RATED MAX. INPUT H. P.	RATED OUTPUT H. P.	RATED SPEED R. P. M.
D·50	80	68	75
C·100	150	128	75
C·150·B	220	187	70
C·250	370	315	65
C·350	600	510	60
E·500	700	595	70
E·700	1000	850	65

First in quality...
First in supply service
in oil country everywhere

NATIONAL BLUE PRODUCTS

THE NATIONAL SUPPLY COMPANY
PITTSBURGH 30, PENNSYLVANIA

DIVISION OFFICES: Denver; Fort Worth; Houston; Toledo; Tulsa; Torrance

CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta

EXPORT: 600 Fifth Avenue, New York 20, N. Y., U. S. A.; River Plate House, 12 South Place, London E. C. 2

for more information on lower pump costs
see next page

keep pump maintenance costs low

with IDEAL®

FLUID END PARTS

For many years, Ideal Fluid End Parts have been important factors in slush pump preventive maintenance programs throughout the world's oil fields. Here's why:

Ideal Fluid End Parts, like all National Supply oil field equipment, are precision-made under strict manufacturing standards. Field-proven time and time again, these parts give exceptionally long service life under varying slush pump operations, reduce replacement costs and keep pumping efficiency high.

Ideal Fluid End Parts are available not only for the famous line of Ideal Slush Pumps, but pumps of other makes, too. You'll find them specially-packaged to insure factory-checked precision when you install them. Look for their bright blue and yellow label of quality today . . . Ideal Fluid End Parts are stocked by National Supply Stores in the United States and Canada, and are obtainable abroad through the Export Division of National Supply.

Rods—Metallurgical control insures maximum resistance to abrasion, corrosion and wear.

Pistons—Molding of rubber to metal core creates positive seal which prevents pressure loss.

Valves and Seats—Maximum opening for fluid flow assures complete filling at high speed.

Gaskets and Packing—Selected for resiliency, and resistance to the effects of chemicals or temperatures.

Liners—Hard, precision finished, working surface for long life, plus carefully-controlled outer dimensions insuring proper fit in pump cylinders.

First in quality...
First in supply service
in oil country everywhere

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PITTSBURGH 30, PENNSYLVANIA

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NATIONAL OIL FIELD MACHINERY AND EQUIPMENT · SPANG STEEL PIPE · SUPERIOR & ATLAS ENGINES

They Say—

Kudos for Our Cover

. . . From a Former Cover Advertiser

Dear Sir:

We have just had the opportunity to examine your January 3 issue with its startlingly new cover treatment. Congratulations on a very sound editorial move which, I am sure, will do much to increase the readership of the editorial pages.

In spite of the fact that your cover change has forced us to relinquish a desirable advertising position, we feel that the increase in readership of the editorial material will in all probability also increase the value of advertising pages inside the book.

Edward E. Beauchamp, Jr.
Advertising Manager
Lane-Wells Co.
Los Angeles, Calif.

. . . Looking Forward to More

Dear Sir:

I was extremely surprised when I opened my January 3 issue of The Oil and Gas Journal to find the face-lifting that had occurred to the cover piece. In my opinion, this is a great improvement over the age-old frontispiece that we were so used to.

I will be looking forward with curiosity to see what you have to offer in future issues.

N. C. Simpson
Manager of Production
Gulf Oil Corp.
Houston, Tex.

. . . He Likes It, Too

Dear Sir:

I like the new cover sheet much better than the old one and was particularly interested in your spotlighting significant developments on the front cover. . . .

J. E. Fenex
Regional Manager of Manufacturing
Rocky Mountain Region
Continental Oil Co.
Denver, Colo.

. . . The Cow's Head Threw Him

Dear Sir:

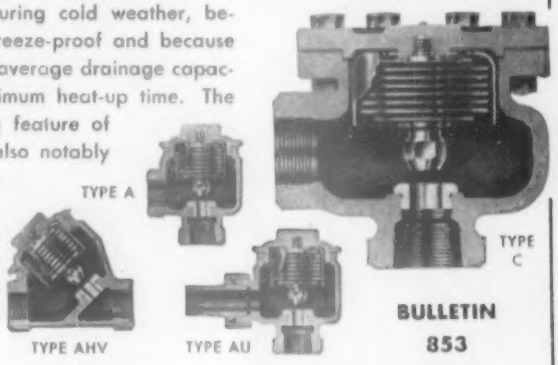
The significance of the front cover picture on the Journal's January 3 issue was not readily grasped by members of my office. One person stated that the cow's head did not remind him of

NICHOLSON MAKES

Freeze-Proof Steam Traps

for every Plant Use

Because they drain completely when cold, these four types of Nicholson steam traps are positively freeze-proof. Can be freely installed outdoors. Universally recommended for use in lines which need not be in continuous use during cold weather, because they are freeze-proof and because their 2 to 6 times average drainage capacity results in minimum heat-up time. The non-air-binding feature of Nicholson traps also notably facilitates heat transfer in severe weather. Types for every plant use. Size ¼" to 2"; pressures to 300 lbs.



BULLETIN 853

210 OREGON ST., WILKES-BARRE, PA.

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

What Do You Need of STEEL!

Delivery of just the steel you need can usually be made from FLINT's stock. GALVANIZED and STRUCTURAL STEEL and WAREHOUSE STEEL. Order steel for heavy construction jobs, petroleum processing or chemical equipment, or warehouse steel in the quantity you need . . . and get prompt delivery from FLINT. Phone, write or wire.

A Complete Service: STEEL • FABRICATION • ERECTION • DETAILING

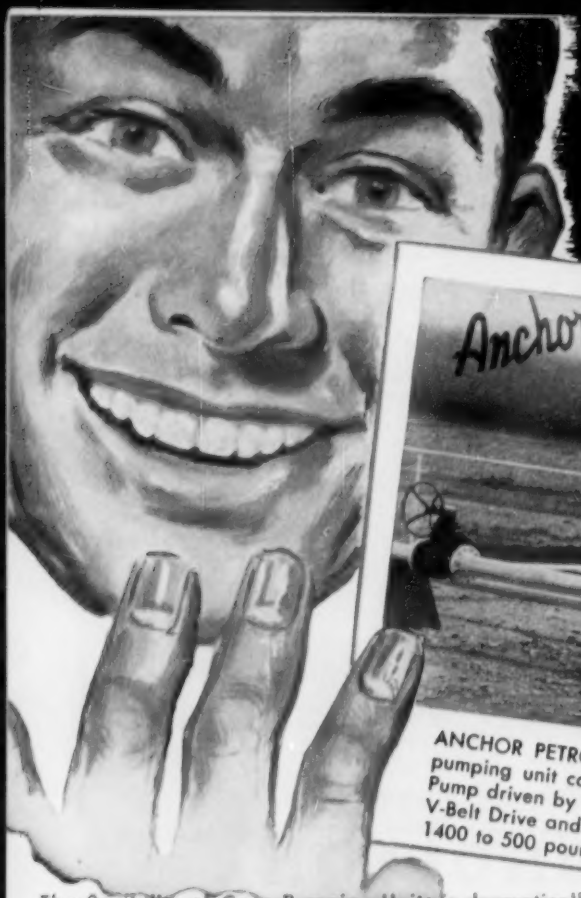
Serving Southwest Industry Since 1915

FLINT STEEL

FLINT STEEL CORPORATION

TULSA • MEMPHIS

GASO PUMP PERFORMS *TRIPLE SERVICE* IN 60,000 BARREL UNDERGROUND STORAGE PLANT



ANCHOR PETROLEUM'S UNDERGROUND STORAGE PLANT near Bath, N. Y. The pumping unit consists of a Fig. 1742 2½" x 5½" x 10" Gaso Duplex Piston Power Pump driven by Model 145-GKU Waukesha Power Unit, complete with steel skids, V-Belt Drive and Guard. Capacity from 38 GPM to 330 GPM at pressures from 1400 to 500 pounds.

The flexibility of Gaso Pumping Units is dramatically demonstrated in the installation pictured above, one of several operated by Anchor Petroleum Company:

1. **In less than 90 days, operating in winter weather, the Gaso Pump washed out salt formation to give Anchor a 60,000-barrel underground storage reservoir.**
2. **Since then the pump has been storing gas in the cavity at a rate of 300 GPM.**
3. **The same pump will be used to displace the gas for consumers' use. Interchangeability of liners assures maximum efficiency on all jobs.**

WE ARE PUMPING SPECIALISTS READY ALWAYS TO HELP YOU IN YOUR PUMPING PROBLEMS

GASO PUMP & BURNER MFG. CO.

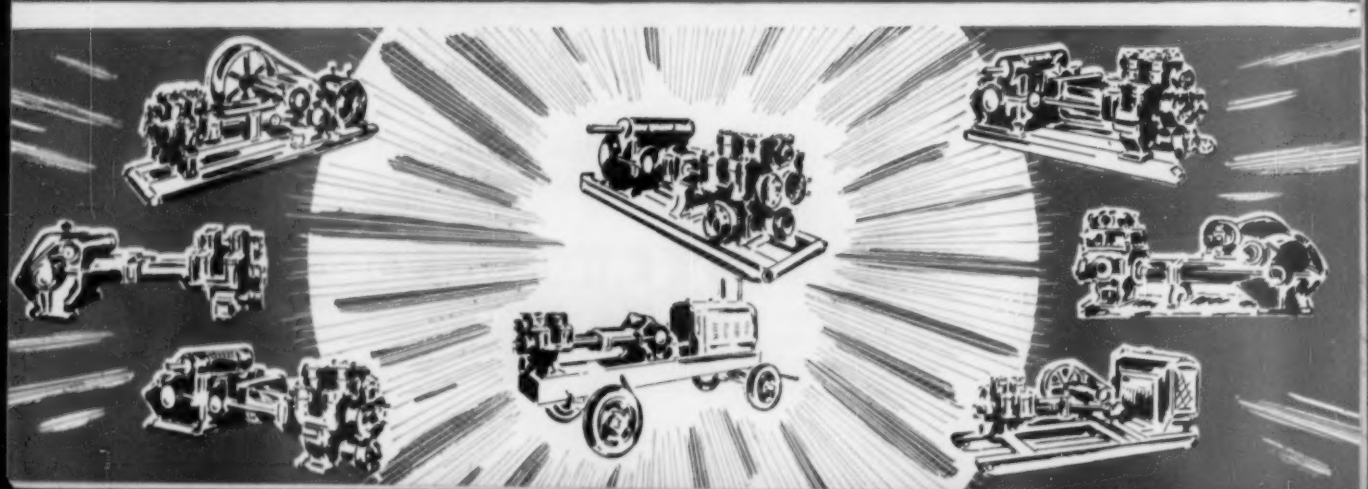
TULSA, OKLAHOMA

EXPORT OFFICE: 149 Broadway, New York

LUFKIN MACHINE CO., Ltd., Edmonton, Alberta
W. L. SONNER COMPANY, Shreveport, Louisiana
Tinsley, Mississippi • Brookhaven, Mississippi • Odessa, Texas
POWER PUMPS, INC., Long Beach, Calif.
PEDDLERS, INC., Houston, Texas
NORTEX ENGINE & EQUIPMENT CO., Wichita Falls, Texas
LUFKIN FOUNDRY & MACHINE CO., Casper, Wyoming

GASO PUMPS

for every oil industry need



West Texas because he had seen too many of them in East Texas where he grew up. Another stated that it could easily be representative of Wyoming as far as he was concerned. I personally did not readily associate the picture with your feature article when I first viewed it.

The idea of having a cover picture to illustrate the feature article is an excellent one. It not only adds to the attractiveness of the magazine but also creates an immediate interest in the feature article. Of course, much depends upon the artist's ability to achieve the desired result.

In all, I think that we could look somewhat positively upon the cow's head illustration, even though our first impressions were somewhat erroneous. Our error in recognition stems from the fact that this was the first attempt with this intent in mind. . . .

Roy A. Bobo
Director
Production Department
Drilling Engineering Division
Phillips Petroleum Co.
Houston, Tex.

. . . It's One in Several Changes

Dear Sir:

I would like to congratulate you and your publication on the new-type cover which went into effect with your January 3 issue.

This change is one of the several that have been made in the last year or so to make The Oil and Gas Journal an even-better and more-interesting publication.

John Sidney Smith
Public Relations Representative
Production Department
Sun Oil Co.
Dallas, Tex.

No Compromise Wanted

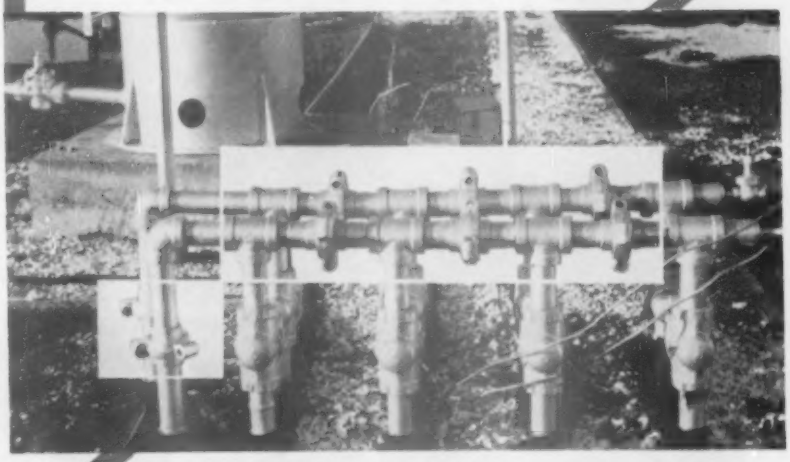
"If the 84th Congress amends the natural-gas act, as it is expected to do, it should not compromise on half measures. The amended law should specifically and clearly limit the authority of the Federal Power Commission to regulate the public-utility phase of natural gas, including interstate movement. FPC should not control the production or intrastate distribution of gas . . ."

Editorial in the Houston Chronicle.

Stop it Now, Or . . .

"The present confused situation (of the natural-gas industry) was foreseen several years ago when Sen. Robert S. Kerr of Oklahoma sponsored a bill to head off federal control. Both houses of Congress passed this measure, but

PERFECT CONNECTIONS



for a PRODUCTION HEADER

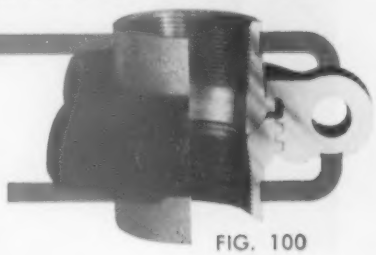


FIG. 100

WECO UNIONS

• Perfect because these WECO Fig. 100 Unions make-up easily and quickly—because their ball and cone seat seals, and stays sealed —because the "Bar-Nut" permits tightening with an ordinary bar or hammer.

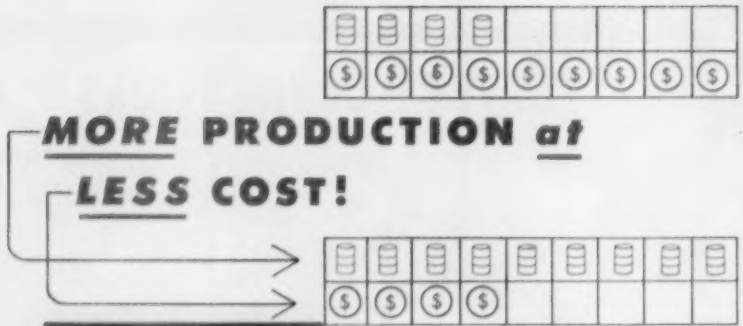
Make-up your production headers with WECO Unions. Regardless of pipe size or line pressure, you can get exactly the WECO Union you need to do the job better.

Sizes: 2", 2½", 3", 4", 6", 8".

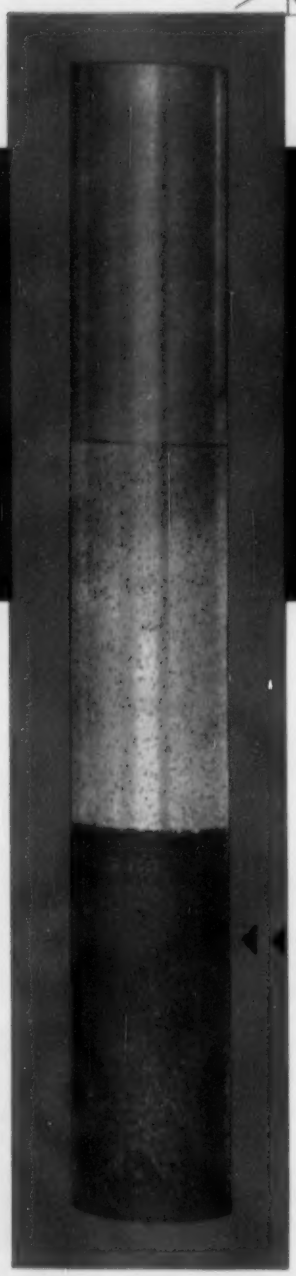
PESA

it's wise to standardize with.. WECO

WECO
WELL EQUIPMENT MFG. CORP. • Division of Chikson Company • HOUSTON 1, TEXAS



MORE PRODUCTION at LESS COST!



Pacific Pacilite

(TRADE MARK)

PLUNGERS & LINERS

Used in thousands of pumps in practically every producing area and under the most severe deep oil well pumping service conditions, Pacific Pacilite liners and plungers have definitely proved their superiority. Longer liner and plunger life is assured without sticking or galling; the possibility of cracking or shearing is virtually eliminated. For further details on the Pacific Pacilite process write for Technical Bulletin #201.

The Pacific Pacilite process is a method of control etching the surfaces of pump liners and plungers to form a multitude of minute reservoirs that absorb and retain lubricants. This greatly increased lubrication allows closer fits between liners and plungers and relieves the plating tensile stress. Note dark, dull, rough finish characteristic of Pacilite processed metal. Center surface; .001" below finish; top surface: .005" below finish.

Pacific Pumps inc.

ONE OF THE DRESSER INDUSTRIES

HUNTINGTON PARK, CALIFORNIA

Export Office: Chanin Bldg., 122 E. 42nd St., New York — *Offices in all Principal Cities*
MID-CONTINENT DIVISION: 1221 E. 1st St., Tulsa, Oklahoma
DISTRIBUTED IN CANADA BY: Lucey Export (Canada) Ltd., 1215 9th Ave., Calgary

DW-11

President Truman vetoed it. Now Sen. Price Daniel of Texas, Rep. Omar Burleson of Texas, and others are ready to press for new bills to undo the court decision.

"Unless this is done, both producers and the consumers of natural gas will be hurt. If allowed to stand, the decision also would set a precedent for imposing federal control over other industries, such as oil and coal. If bureaucrats in Washington are allowed to control the whole gas industry, there will be little to keep them from grasping control of other industries and thus snuffing out business incentive and free competition."

Editorial in the Dallas Morning News.

Natural Gas Only Part of Issue

"Far more is involved in the natural-gas issue than natural gas. Basic and traditional philosphies of competitive American enterprise are at stake. The year 1955 will see these philosphies weighed and evaluated through the natural-gas question. If Congress enacts legislation to correct the present situation as to natural gas, the nation will have taken a step towards the preservation of those philosphies which have enabled this country to enjoy the highest standard of living in the world. . . ."

Russell B. Brown, general counsel of the Independent Petroleum Association of America, is a statement released in Washington.

CALENDAR OF EVENTS

JANUARY

26-28 Symposium on instrumentation for process industries, A & M. College of Texas, College Station, Tex.

27-28 American Chemical Society, symposium on hydrocarbon chemistry, Rice Hotel, Houston.

27-28 Southern California Meter Association, fourth annual instrument short course, Los Angeles Harbor Junior College, Wilmington, Calif.

31-Feb. 2 Sixth annual Southeastern Symposium on Industrial Instrumentation, University of Florida campus, Gainesville, Fla.

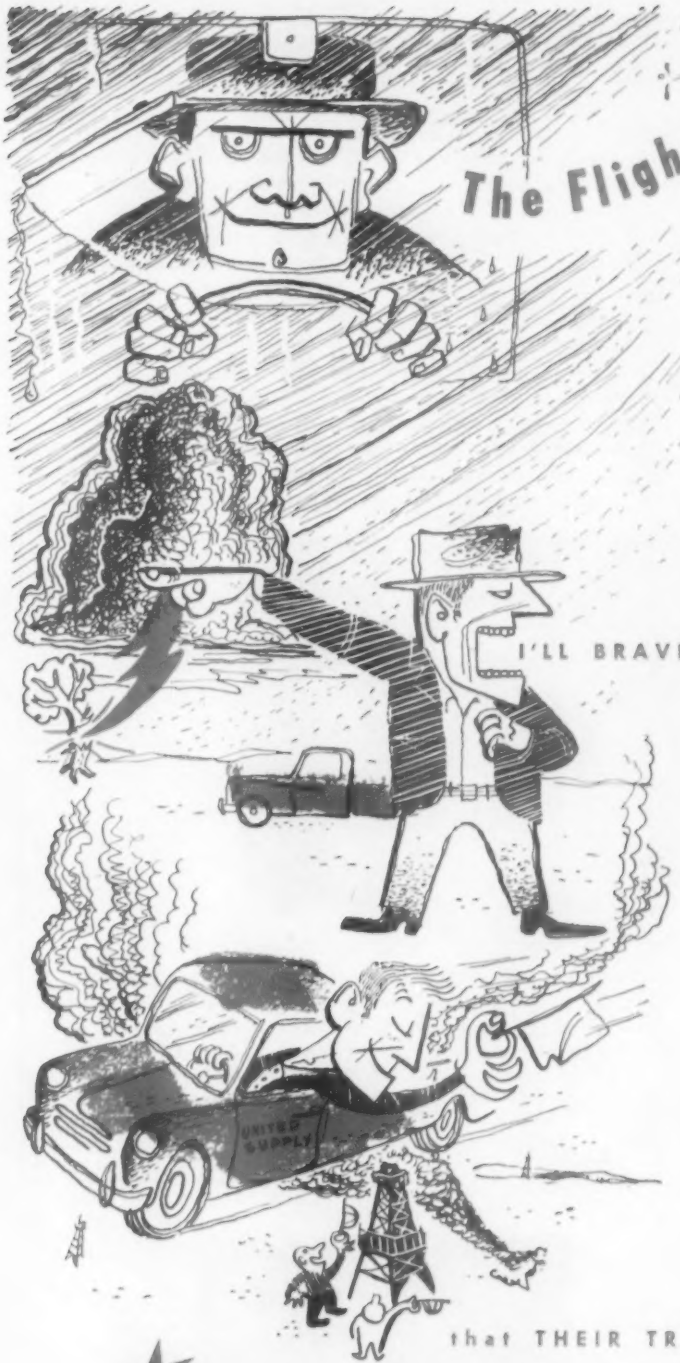
FEBRUARY

10-12 Seventh Southwestern IRE Conference and Electronics Show, Baker Hotel, Dallas.

13-17 American Institute of Mining and Metallurgical Engineers, annual meeting, Conrad Hilton Hotel, Chicago.

13-18 A.S.T.M. Committee D-2 on Petroleum Products and Lubricants, Rice Hotel, Houston.

14-16 Rocky Mountain section of A.A.P.G., annual regional convention, Billings, Mont.



The Flight of Elmer Quillback

You've all heard the story of Paul Revere
and his famous ride at night
But listen, my friends, and you shall hear
of another famous flight.

Elmer Quillback drove a pick-up truck
for United Supply—no less!
He worked very hard to earn every buck
and make himself a success.

He drove supplies to oil field rigs
to keep them makin' hole—
it took a lot of thingamajigs
to keep them under control.

One night his big chance came
just as he was quittin' work
A Judson county rig was lame
the engine wouldn't perk.

You can count on me, said Elmer,
to deliver the parts, I'm proud
to serve United's customer—

I'LL BRAVE YON THUNDER CLOUD!''

They loaded the parts in nothin' flat
and Elmer began to roll—
on safety he always stood pat
as he sped toward his goal.

It was a night that really wasn't fit
for man or even beast—
and when the big storm really hit
Elmer just kept headin' East.

He knew United's slogan well
"You can rely on United Supply"
to look at his face you could tell
that to him it was do or die.

Suddenly his truck took off the ground
up into a funnel-shaped cloud.
The roar of the wind made a terrible sound
and Elmer sang out loud.

"Off we go into the wild blue yonder"
His voice rang clear and true
But his mind would never wander
from the job he had to do.

Now his truck began to descend
and Elmer saw his final goal
He knew he'd be a godsend
to the drillers waitin' at the hole.

As he touched the ground he heard a cheer
from the drillers shouting for joy.
"The supplies are already here—
they'll really be proud of this boy!

Now we know that the service is keen
that you get from United Supply
But Elmer Quillback proved what they mean

that THEIR TRUCKS COME ON THE FLY!

YOU CAN RELY ON UNITED SUPPLY!
UNITED SUPPLY
COURTESY • SERVICE • DEPENDABILITY

UNITED SUPPLY

AND *Manufacturing* COMPANY

TULSA, OKLAHOMA

Stores in KANSAS, OKLAHOMA, TEXAS, LOUISIANA, AND NEW MEXICO

COURTESY • SERVICE • DEPENDABILITY

CEC increases the scope of

industrial mass spectrometry

through two great instruments for process monitoring and control

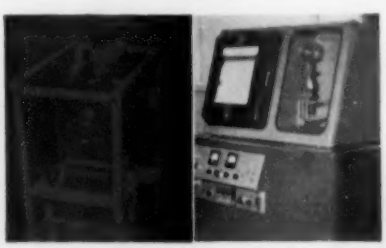
Consolidated's Model 21-610 mass-spectrometer and its companion, the new Model 21-620, far excel all other instruments of comparable price in performance capabilities and reliability in industrial environment. The extreme sensitivity of the 21-610—accurate to a few parts per million—qualify it for highly critical purity studies as well as process monitoring and control applications. Fitted with an accessory hand-held probe, either model serves as a leak detector for any gas within its mass-range. The 21-620's resolving power up to mass 150 further extends the applicability of an industrial mass-spectrometer to research laboratories and medical centers, as well as to plants of chemical, petro-chemical, petroleum and gas industries. Nearly identical in appearance, the 21-610 features the Diatron ion analyzer and the 21-620, a new cycloidal focusing analyzer.

21-620 Except for slightly less sensitivity, the 21-620 has all the capabilities of the 21-610 plus many others. Where the task is to analyze "heavy" gases or liquids, either in plant locations or in the laboratory, the 21-620 process monitor mass-spectrometer is the ideal control instrument.

21-610 The 21-610 is completely self-contained, needing only 110 volts and a small quantity of cooling water for operation. Moderately priced, easily movable, and economical to operate, the 21-610 is industry's ideal instrument for chemical research, process control and leak detection.

CEC Service Engineers quick change of ion analyzers (right) adds flexibility to Consolidated's two process monitoring mass-spectrometers. A cycloidal focusing analyzer assembly of the 21-620 type is being mounted in the vacuum rack in place of the Diatron analyzer of the 21-610.

The basic instrument can be augmented by many available accessories, thus broadening its application scope. At the far right, are a gas or light-liquid sample inlet system and chart recorder.



Consolidated Engineering
CORPORATION
300 North Sierra Madre Villa, Pasadena 15, California

Sales and Service through **CEC INSTRUMENTS, INC.**, *a subsidiary with offices in: Albuquerque, Atlanta, Buffalo, Chicago, Dallas, Detroit, New York, Pasadena, Philadelphia, Seattle, Washington, D. C.*

ANALYTICAL INSTRUMENTS FOR SCIENCE AND INDUSTRY

Investigate the application of industrial mass-spectrometry to your business. For full details about CEC's two companion process monitoring mass-spectrometers, send for Bulletin CEC 1824A-X6.

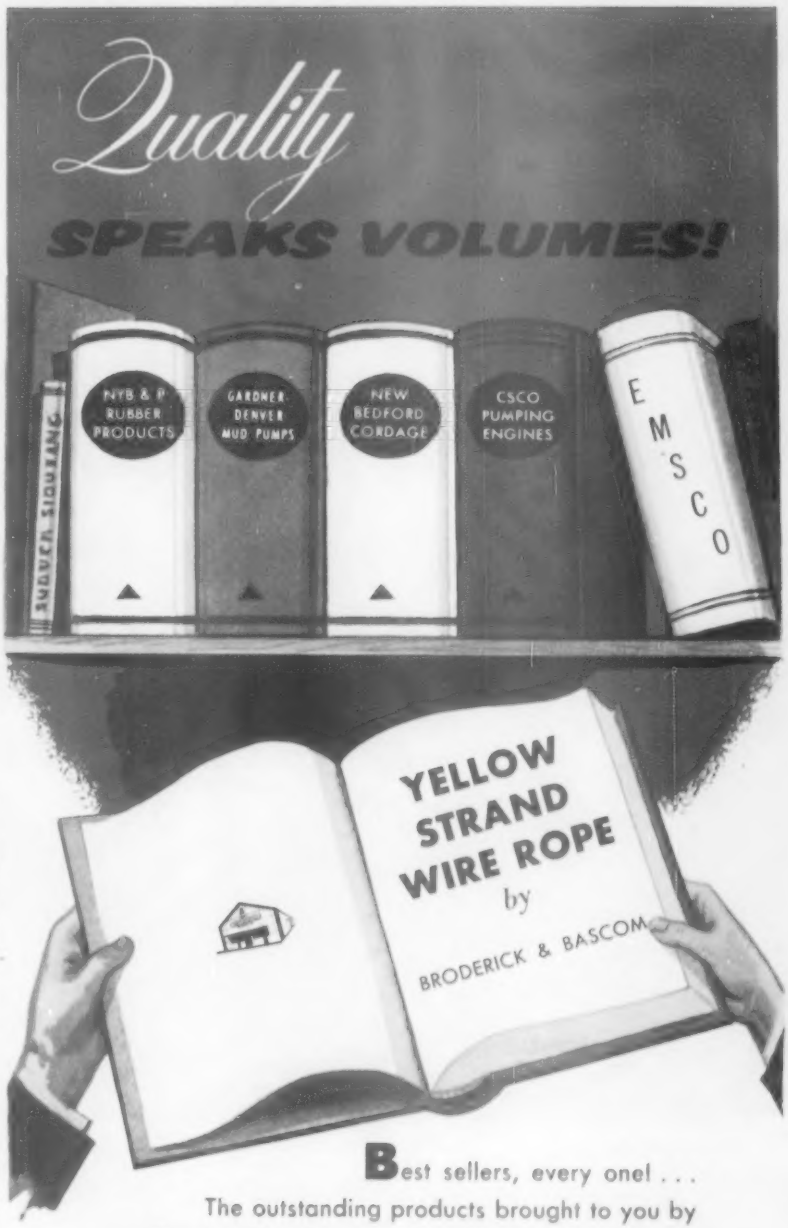
16-18 National Association of Corrosion Engineers, sixth annual short course for pipeliners, Mayo Hotel, Tulsa.
23-24 Pacific Coast Gas Association, seminar on electronic data processing, Los Angeles.
25 National Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

MARCH

1-2 American Gas Association committee on natural gas reserves, Baker Hotel, Dallas.
1-2 Fourth Symposium on Subsurface Geology, University of Oklahoma School of Geology and Oklahoma Geological Survey, Oklahoma Memorial Union Building, Norman, Okla.
4 Southern Gas Association, transmission management conference, Shamrock Hotel, Houston.
7-11 National Association of Corrosion Engineers, Palmer House, Chicago.
9-11 American Petroleum Institute, Division of Production, Southwestern spring meeting, Jung Hotel, New Orleans.
19-18 Southern Gas Association, Distribution Management Conference, Jung Hotel, New Orleans.
20-23 American Institute of Chemical Engineers, Kentucky Hotel, Louisville.
23-24 Pacific Coast Gas Association, accident prevention conference, Santa Barbara, Calif.
23-25 American Petroleum Institute, Division of Production, Mid-Continent District, Herring Hotel, Amarillo, Tex.
27-29 Texas Independent Producers and Royalty Owners Association, ninth annual meeting, Hotel Texas, Fort Worth.
28-30 Western Petroleum Refiners Association, 43rd annual meeting, Plaza Hotel, San Antonio.
28-31 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Exploration Paleontologists and Mineralogists, annual meeting, Hotel Statler, New York.
28 April 1 American Society for Metals, 9th western exposition and congress, Pan American Auditorium, Los Angeles.

APRIL

5-7 Corrosion control short course, sponsored by University of Oklahoma and Central Oklahoma Section of National Association of Corrosion Engineers, University of Oklahoma Extension Study Center, Norman, Okla.
7-8 Rocky Mountain District, American Petroleum Institute, Division of Production, Gladstone Hotel, Casper, Wyo.
13-15 Natural Gasoline Association of America, annual convention, Baker and Adolphus hotels, Dallas.
13-15 American Society of Lubrication Engineers, tenth annual meeting, Hotel Sherman, Chicago.
13-15 National Petroleum Association, 52nd semiannual meeting, Cleveland Hotel Cleveland.
18-20 American Society of Mechanical Engineers, spring meeting, Lord Baltimore Hotel, Baltimore.
19-20 Pacific Coast Gas Association, distribution conference, Phoenix.
19-21 Southwestern Gas Measurement Short Course, North Campus, University of Oklahoma, Norman, Okla.
20-22 Petroleum Industry Electrical Association, annual conference, Shamrock Hotel, Houston.
25-26 Independent Petroleum Association of



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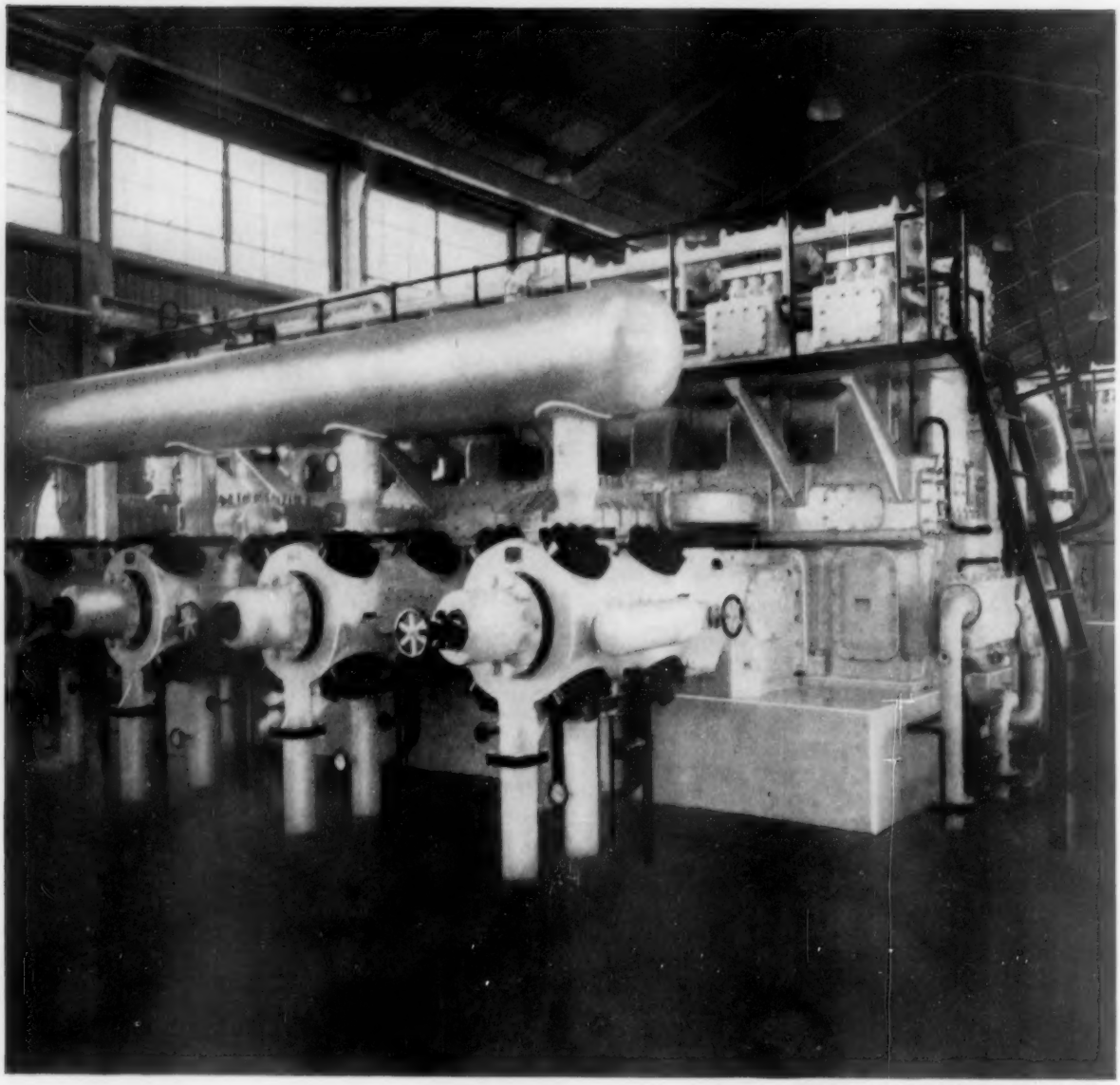
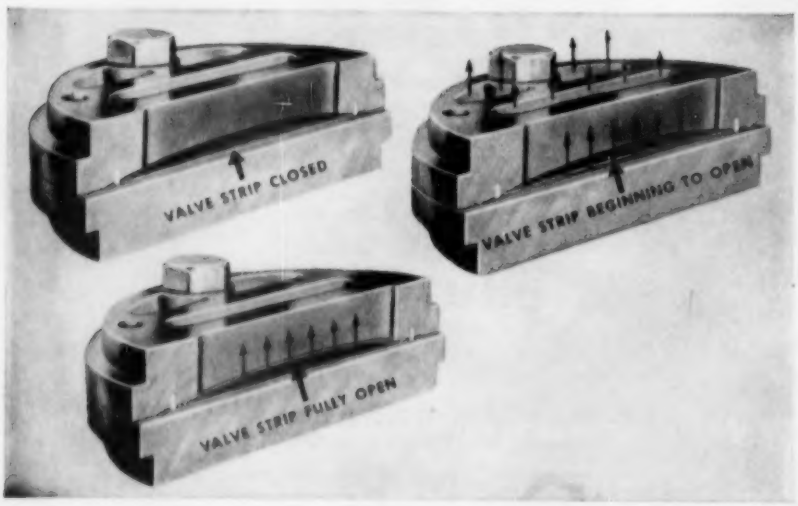
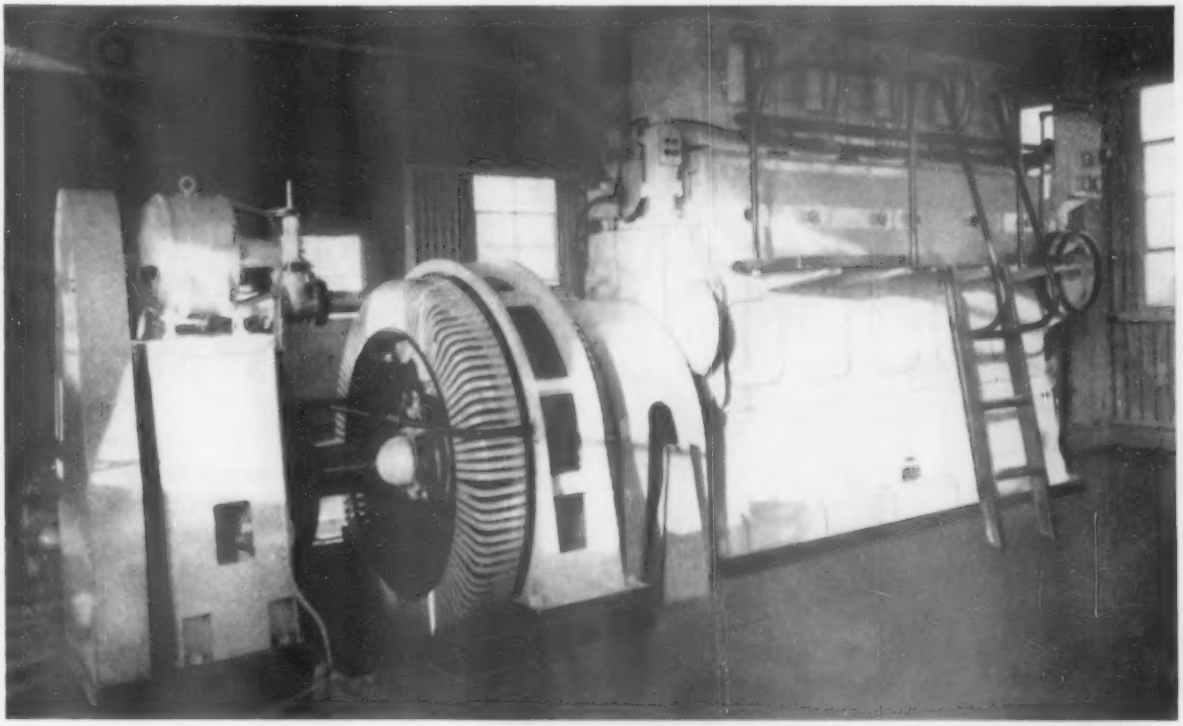


ONE OF FIVE MODERN WORTHINGTON UTC ENGINE-COMPRESSORS at the United Gas Pipe Line Company's McComb, Mississippi, compressor station. McComb is one of the key installations on a new 30" line that carries gas from Louisiana fields and underwater wells in the Gulf of Mexico, north to Jackson and Kosciusko, Miss. Gas is delivered to McComb at 727 psig, and the Worthington UTC's discharge the gas 68 miles north to Jackson and another 58 miles north to Kosciusko.



THE QUIET-OPERATING WORTHINGTON FEATHER VALVE, standard equipment on all Worthington compressors, is made up of a series of thin flexible strips of ribbon steel, held in position over rectangular openings by curved milled guards. In addition to providing quiet operation, the absence of impact results in long valve life and low maintenance costs.



McCOMB STATION IS MADE SELF-SUFFICIENT by this CCG-5 Worthington natural gas engine, which supplies electric power for safety system solenoids and other emergency requirements if normal power supply fails.

Sound plant design pays off in new United Gas Pipe Line Company's compressor station

• First new compressor station to go into service in United Gas' three-year $250,000,000 expansion program is the McComb, Mississippi, plant, where five 1600-hp Worthington UTC engine-compressors are in operation, designed to handle 470,000,000 cubic ft. of gas per day. End result of this expansion will be to make United Gas the first company in the world capable of handling a trillion cubic feet of gas per hour.

The benefits of good plant design and proper operation are evident at the McComb Station. Since April 3, 1952, when the Worthington UTC's were started up, the station has been remarkably free of "bugs"; there has not been a single shut-down because of engine failure.

Contributing largely to this fine record have been the time-tested features of the Worthington UTC's. For example, every Worthington compressor is equipped with the exclusive Feather* Valve — the lightest, tightest, most efficient valve available. Records show that Worthington Feather Valves have materially reduced power costs.

While Worthington UTC compressors are widely used for pipeline gas compression, they are also well suited to many other jobs, such as pressure maintenance on oil wells; varied service in natural gasoline plants; solvent extraction, vapor recovery, and recycling and stabilization of gases in oil refineries.

If your business requires gas compression, it will pay you to write for further information on the Worthington UTC Engine-Compressor. Sizes range from 1,000 to 2,000 hp. Write directly to Worthington Corporation, Engine Division, Buffalo, New York, for Bulletin S-500-B23B.

*Reg.U.S.Pat.Off.

EK.3.4

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AMERICAN IRON

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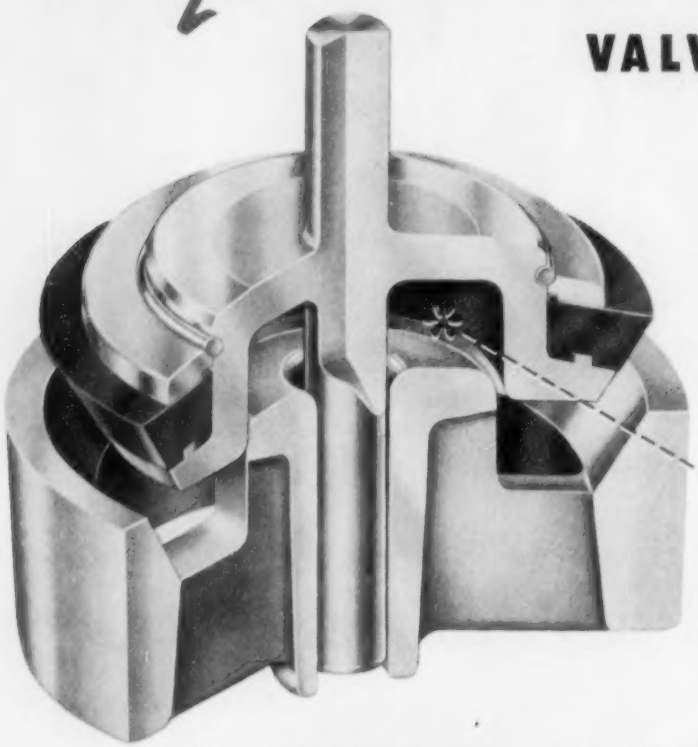
VALVES & SEATS



A radically new concept in slush pump Valve and Seat design . . . unique in the respect that it answers the urgent need for a slush pump valve and seat which will perform satisfactorily under **extremely high** pump pressures . . . as well as pressures encountered under ordinary pumping conditions.

HYDRAULIC CUSHION ACTION

This new design is named from the **hydraulic cushion action** which results when the mud trapped in the cylindrical mud chamber of the valve is forced down and around the outside of the mushroom top of the valve seat on the downward stroke. The **hydraulic cushion action** of the Hydra-Cushion Valve and Seat functions exactly in the same manner as a hydraulic shock absorber, in cushioning the impact of the valve on the seat.

Hydra-Cushion Valves and Seats also incorporate many of the outstanding design features of the regular American Iron slush pump valve and seat . . . such as the three-web seat, for maximum fluid passage, without increase in fluid velocity . . . and the specially designed compound 808 insert, which outlasts other inserts on the market today!

Hydra-Cushion Valves and Seats last longer because they provide more support of valve on seat than any other valve seat in operation today.

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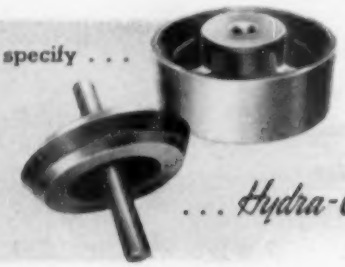

. . . *Hydra-Cushion*

America, midyear meeting, San Antonio.

28-29 American Petroleum Institute, Division of Production, spring meeting of Pacific Coast district, Statler Hotel, Los Angeles.

29-30 American Association of Petroleum Landmen convention, Hilton Hotel, Fort Worth.

MAY

1-4 Liquefied Petroleum Gas Association, annual convention, Conrad Hilton Hotel, Chicago.

1-4 American Institute of Chemical Engineers, Shamrock Hotel, Houston.

9-10 American Gas Association, Gas Supply, Transmission and Storage Conference, Hotel William Penn, Pittsburgh.

9-12 American Petroleum Institute, Division of Refining, midyear meeting, Jefferson Hotel, St. Louis.

11-12 Pacific Coast Gas Association, gas supply and transmission and conference of technical session, Palm Springs, Calif.

11-13 American Petroleum Institute, Division of Production, Eastern District spring meeting, William Penn Hotel, Pittsburgh.

12-19 Sixth Latin American Congress of Chemistry, Caracas, Venezuela.

14-22 World Wide Chemical Plant and Equipment Exposition and Congress, Frankfurt, Germany.

16-18 American Petroleum Institute, Division of Transportation, products pipeline confrence, Edgewater Beach Hotel, Chicago.

16-18 Southern Gas Association, New Orleans.

23-25 American Petroleum Institute, Division of Marketing, midyear meeting, Chase and Park Plaza hotels, St. Louis.

26-27 Kentucky Oil and Gas Association, annual meeting, Lafayette Hotel, Lexington.

30-June 1 Chemical Institute of Canada, thirty-eighth annual conference and exhibition, Quebec City, Que.

JUNE

5-9 Canadian Gas Association, annual meeting, Sheraton-Brock Hotel, Niagara Falls, Ont.

6-10 American Petroleum Institute, Division of Production, midyear committee conference, Brown Palace Hotel, Denver.

6-15 Fourth World Petroleum Congress, Rome, Italy.

9-10 Natural Gas and Petroleum Association of Canada, Royal Connaught Hotel, Hamilton, Ont.

9-10 Pennsylvania Grade Crude Oil Association, annual meeting, Hotel William Penn, Pittsburgh.

11-15 Petroleum Equipment Suppliers Association, annual meeting, Banff Springs Hotel, Banff, Alberta, Canada.

12-17 Society of Automotive Engineers, golden anniversary summer meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

16-18 Interstate Oil Compact Commission, Denver.

20-23 American Society of Mechanical Engineers, semiannual meeting, Statler Hotel, Boston.

28-July 1 American Society for Testing Materials, Chalfonte-Hadden Hall, Atlantic City, N. J.

AUGUST

15-17 Society of Automotive Engineers, golden anniversary West Coast meeting, Hotel Multnomah, Portland, Ore.

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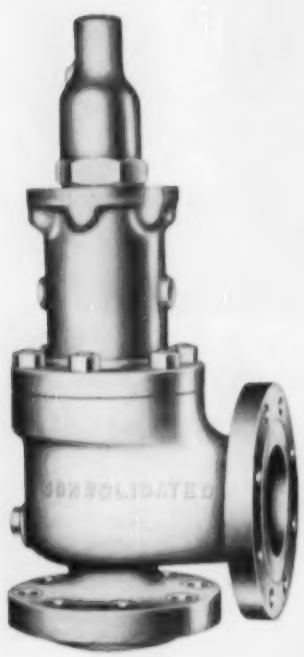


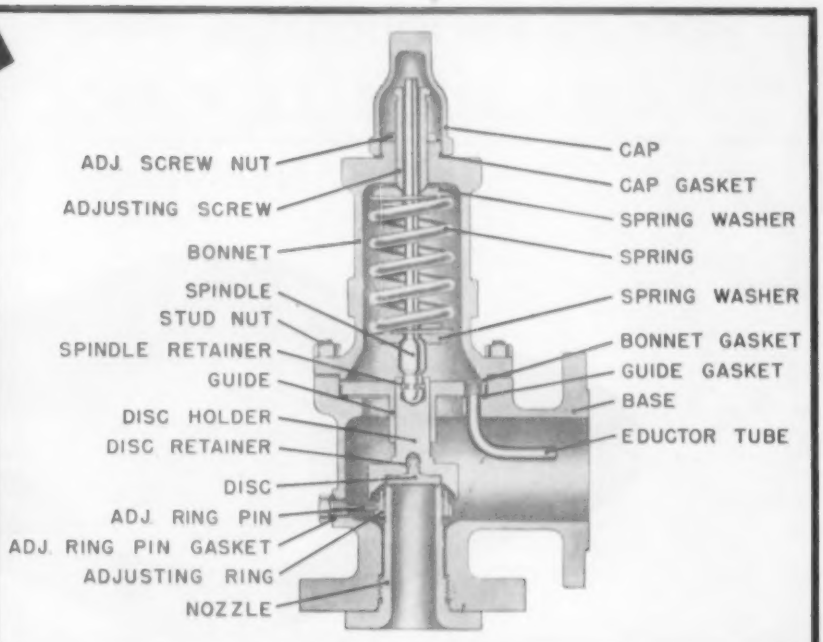
"Two-In-One" design, improved performance . . . the new Consolidated Safety Relief Valve is the result of over 4,000 flow tests in 5 years at West Edmond, Oklahoma. At the A.S.M.E.-approved testing station there, natural gas is available in flow capacities up to 35,000 cfm and pressures up to 500 psig. The A.S.M.E.-approved conditions, apparatus, and procedures permitted Consolidated engineers to test-develop and prove the full range of valve sizes and pressures in both Standard and Bellows designs.

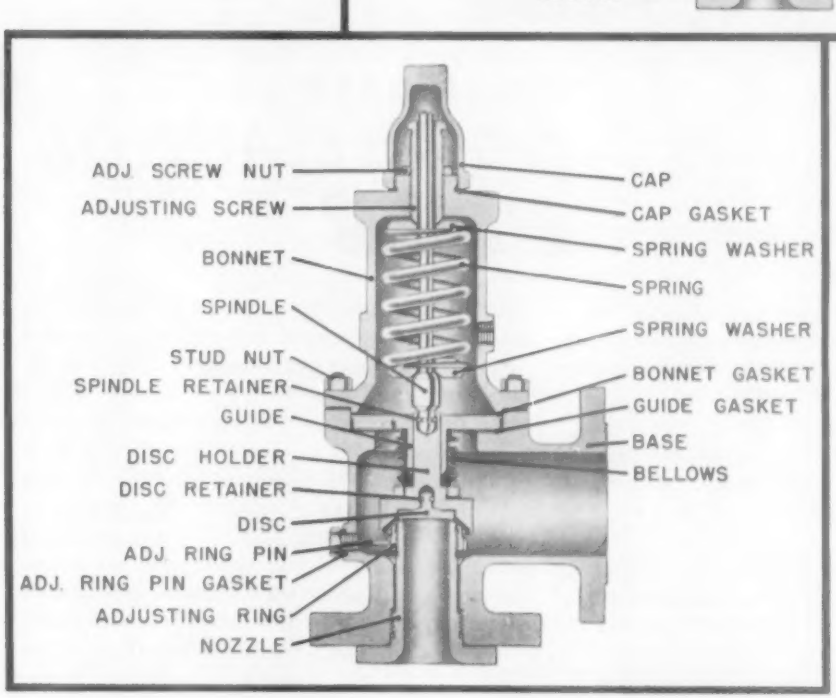
Interchangeability is so highly developed that the majority of Consolidated Standard Valves can be converted to the Bellows design, in the field, simply by installing the bellows. Each type has fewer functional parts than other comparable safety relief valves. Standardization of inlet and outlet center-to-face dimensions permits interchangeability with a large proportion of the valves of other manufacturers. Incorporated is an optically-ground flat seating surface that contributes to easier, more economical maintenance.

You can have the absolute protection and real economy of the thoroughly tried and proved Consolidated Safety Relief Valves for your plant today. Both Standard and Bellows types are available in sizes and pressures to meet requirements of the most advanced processing facilities. Write for full details. Ask for Catalog 1900.

CONSOLIDATED SAFETY RELIEF VALVES

STANDARD VALVE has an eductor tube that holds the pressure in the valve bonnet to approximately atmospheric pressure; thus only the force of the spring controls the valve. Valve action is improved and stabilized . . . repetitive flow capacity is provided . . . a new high in operational dependability is assured. Even under repeated popping of the valve, set pressure and blowdown are consistent. The valve will open to full capacity at 3% overpressure regardless of the position of the adjusting ring.





BELLOWS VALVE is like the Standard but has a durable, two-ply stainless steel sealing bellows which effectively isolates from the valve's working parts any contaminants, corrosion, or viscous fluids. The bellows is balanced with the seating surface: set pressure of the valve is not affected by back pressure, whether constant or variable. Consequently, smaller discharge piping can be used, thus reducing the cost of pressure-relieving systems.

Certified and Approved

Both Standard and Bellows Valves are approved under A.P.I.-A.S.M.E. Unfired Pressure Vessel Codes, A.S.M.E. Unfired Pressure Vessel Code and are certified by the National Board of Boiler and Pressure Vessel Inspectors.

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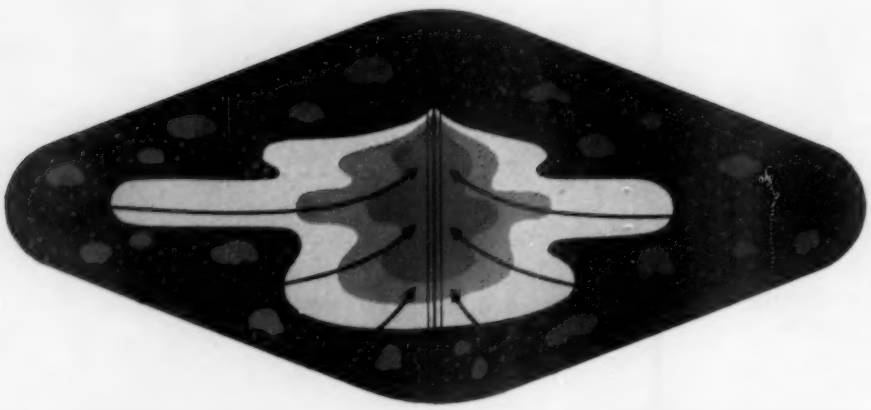
BOOSTS PRODUCTION IN BENTONITIC SANDS



HALLIBURTON'S *DOUBLE ACTION* MCA

Bentonitic sands that have been contaminated by water, during drilling or completion work, usually mean production problems – the water-swollen particles of bentonite block void spaces and greatly reduce the permeability in sand. But an economical treatment with Halliburton's MCA shrinks bentonite, releases water and disperses the mud particles – opening the way to increased oil flow and more profitable production!

MCA is the double action, doubly effective Mud Cleanout Agent that *is proved twice as powerful* as a single action acid for treating bentonitic sands. The hydrochloric acid in the MCA compound causes a base exchange in the bentonite which releases adsorbed water and shrinks the clogging particles. Then Morflo, the highly active surfactant, disperses the reduced particles and helps flush them from the formation.

This double action from HCl and Morflo is equally effective in dissolving calcareous content of mud, breaking water blocks, destroying water-oil emulsions and dispersing mud or detritus. For old or new wells, call for MCA – the only agent that can attack *all* plugging materials with an economical, easy-to-use treatment. Learn about MCA's success in your area and how it can help your well be a more successful producer. Call your local or district office of the Halliburton Oil Well Cementing Company.

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TULSA, OKLAHOMA

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JOURNALLY SPEAKING . . .

Page One

WELL, how do you like it—the new Page One feature we promised would start this week?

You must have seen it if you opened the cover, because its name and its location are identical. Incidentally, the staff kicked around a couple of dozen suggested titles for this feature but we had been calling it "page one" among ourselves for so long that the name finally became official. Besides, it seemed to fill the bill better than anything else that was proposed.

The purpose of Page One is to give you a glimpse into the future. Here we will spot trends in the industry, forecast probable (or possible) developments, and point out the significance of things that are happening currently.

This isn't crystal-ball gazing—just forward-looking reporting and cognitive evaluation. Our far-flung editorial staff, with its finger on the pulse of every phase of the oil and gas industry, is in position to know what oil men are talking about and what chain of events may be triggered by some present or future action.

It's our men's job to look ahead constantly so they will know what subjects to write about next week or next month. So we decided to pass on some of these prophetic observations and educated guesses to our readers. Page One is a staff job, and reflects the judgment of all of us.

But don't expect us to guarantee the accuracy of all our forecasts. The items are simply the way things look to us at the time we go to press. As everybody in the industry knows, things in this fast-moving business are even worse than a railroad timetable in being subject to change without notice.

Big Table

AND how do you like our Table of Contents spread across pages 2 and 3? Hope nobody had any trouble finding it. It will be in this same place every week from now on.

Using two pages permits us to get a little "air" into the Table of Contents, loosen it up a little, get away from the crowded appearance, and tell a little more about some of our features. These advantages, we're sure, far outweigh the slight convenience of having everything on a single page just inside the front cover.

This Week

NOW look two pages to the east of where you are now and see what we've done to our long-standing and always-popular "This Week in the News." We've taken off the picture to permit us to use larger type and more white space for easy reading.

The style of writing has been changed a bit, too, with the idea of letting you get the gist of the news in less time. But the content of this page remains basically the same as it always has been—a quick summary of the oil and gas news of the week digested from material on following pages of the same issue of the Big Yellow Book. Many readers tell us this is the page they always read first, particularly when they don't have time at the moment to go through the whole issue.

This Page

THIS page has been changed, too. The masthead which used to appear in the left column has been divided, with the editors' names transferred to the Table of Contents and only the business staff left here.

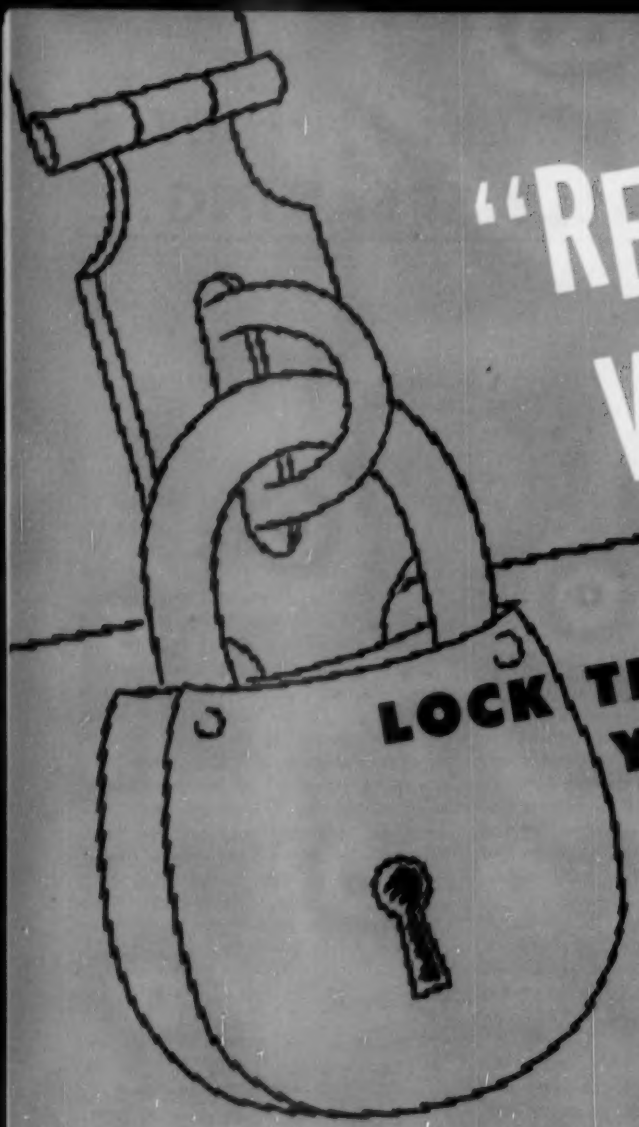
The new type in the heading at the top is just an attempt to make this department conform to the style of the rest of the magazine. That's a futile hope. We promise that the contents of this page will remain completely unpredictable and nonconformist.

Next Week

NEXT week the Annual. As usual, the last issue in January is our annual Review and Forecast number. The fact that there are five Mondays in the month this year makes it almost a week later than it was last year, a circumstance which made a few people apprehensive that we might have abandoned it altogether.

Not at all. Half the staff has been working day and night on it for a month. It'll be along January 31, bigger and better than ever.

—Henry D. Ralph.



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Advocates of gas control have scored some good licks

GAS producers have suffered a serious setback in their fight to get out from under federal control. They appear to have lost the first round.

At the Federal Power Commission hearings on the type of standard to be used in judging the reasonableness of well-head prices, opponents advanced a line of argument that is bad law and worse economics—but mighty smart politics.

The very heart of regulation is price. Arguments over certificates, facilities, and other points are subsidiary to the prime question of what prices producers will receive and what yardstick the FPC will use in regulating them.

AT THE HEARING, producers did an excellent job of demonstrating that no practical formula can be devised and so the whole thesis of regulation must fall for want of a premise. This is the gist of the argument that will be used with Congress to show the imperative need for legislation completely exempting production and gathering.

But opponents undermined this argument by blandly ignoring it. These were chiefly local distribution utilities in northern and eastern cities, a number of state utility commissions, and some transmission lines.

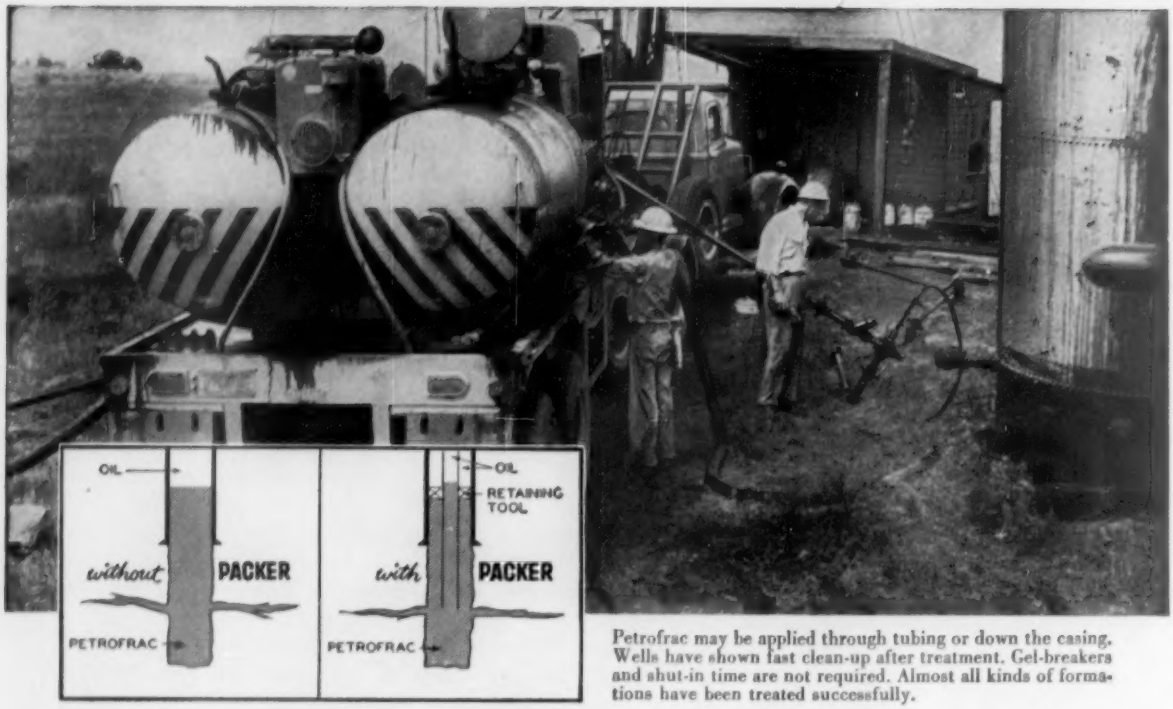
They told FPC: Go ahead and regulate prices without any yardstick; freeze most prices at their present levels; roll back some recent advances to the level of what distant distributors can afford to pay under their locally regulated retail rates. Then meet the producers' insistence on the need for incentives to develop new reserves by promising to consider higher prices for new gas offered to new markets.

Only a few advocated the standard utility cost-base yardstick. Some vaguely suggested that standards might be developed on the heating value of gas. All opposed the producers' plea to accept arms'-length contracts made before the date of the Phillips decision.

THE OPPONENTS' ARGUMENTS are that distributors and their customers can't afford to pay more for gas than at present, or even as much in some instances; that producers will be amply compensated by continuing to get about what they have been getting and that this involves no regulatory difficulties; and that problems of future prices and supplies can be dealt with when and if they arise.

Such reasoning ignores the economic facts of life, but it will sound very plausible to much of the public, much of Congress, and perhaps much of the FPC. It will look to them like a practical compromise of a situation that producers know is an impossible dilemma.

A half-truth is harder to fight than a lie, and the distributors' arguments contain enough half-truths to make them formidable.



Petrofrac may be applied through tubing or down the casing. Wells have shown fast clean-up after treatment. Gel-breakers and shut-in time are not required. Almost all kinds of formations have been treated successfully.

PETROFRAC—NEW FRACTURING SERVICE BOOSTED PRODUCTION 696 BOPD

DOWELL fracturing method makes use of operator's lease crude oil . . . can be tailor-made to suit well conditions

Here's a new Dowell fracturing service designed to increase production from oil and gas wells. It's Petrofrac* —a treatment that uses graded sand and your own lease crude oil. The oil is thickened with a special chemical agent to give it enough body to suspend and carry the sand into the formation.

For proof of its effectiveness, look at this actual case history: An old well was plugged back and perforated opposite a sandstone formation. The well swabbed 24 BOPD. Then Petrofrac jumped production to 720 BOPD, flowing. After a period of flush production, this well leveled off at 300 BOPD, pumping and flowing.

Kerosene, diesel fuel or distillate may be used when lease crude is not available or suitable. As in other Dowell fracturing services, sand may be pumped into the formation in batches—a fine-grained sand followed by a coarse-grained sand.** This is designed to give larger fractures and better fluid drainage.

For more information on Petrofrac or other Dowell services—such as acidizing, perforating, Electric Pilot—call your nearest Dowell station today! Or write directly to Dept. A-11, DOWELL INCORPORATED, TULSA 1, OKLAHOMA.

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services for the oil industry

DOWELL

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THIS WEEK . . . . . IN THE NEWS

FPC slippery in court

Industry lawyers will have a lot of trouble trying to get the FPC into court for a legal tussle over the controversial gas-price control orders. Attorneys are convinced the FPC has laid very careful plans to avoid court tests of the questions involved. Frustrated natural-gas lawyers can't pin down the elusive federal agency, because it takes conflicting positions to combat similar questions in different courts. A number of recent legal moves by the gas industry are designed to force the FPC into a court stand.

Sunray courting Mid-Continent

Talks going on between top officials of Sunray and Mid-Continent and under the watchful eye of eastern bankers with big investments in Mid-Continent could bring about a $474 million consolidation. If it goes through, the merger will unite the assets of a successful exploration company with a thriving refining and marketing firm which already blankets most of the Mid-Continent area.

Third Scurry flood proposed

More flooding in the famous Canyon Reef of Texas' Scurry County is planned by Warren Petroleum Corp. and 18 other companies, which would form the Sharon Ridge Canyon Unit. This third big flood will take in 13,500 productive acres in Sharon Ridge-Diamond "M" field and will recover an estimated 109,000,000 bbl. of additional oil. The new unit is immediately south of Diamond "M" unit, which is just south of the big SACROC project.

Bright future seen for pipelining

This year will be one of the best in the history of pipelining. This was the theme of the seventh annual meeting last week of the Pipe Line Contractors Association. H. C. Price, Bartlesville, Okla., contractor and newly elected association president, sounded the one note of warning. Price expects big things of 1955, but there is one big if—if the Phillips case is reversed by congressional action.

Geochemical field wide open

Geochemical prospecting—hunting oil by looking for hydrocarbon traces on the earth's surface and in drill holes—may receive new attention as a possible practical exploration tool. A recent federal court opinion outlaws patents on two geochemical methods and the decision could throw the field open for more research in this field. One patent involved a method of analyzing surface samples for hydrocarbons and other compounds found near oil deposits. The other was for a method of well logging above the drill bit and analyzing cores and cutting samples for the same type of traces.

Australia's still looking

Intensive drilling will continue in Australia, despite disappointing results in recent months. Drilling pace will slacken in the Rough Range area, scene of the country's only oil discovery, following abandonment of fifth successive dry hole. Wildcat now will be drilled about 100 miles south of discovery.

California fills gas gaps

Diving temperatures in the Los Angeles area and other parts of Southern California this winter are giving engineers for gas companies a chance to test their underground storage reservoirs for gas to meet peak loads. Four reservoirs are helping fill a 400,000-plus M.c.f. gap between the area's available gas supply and top consumption. A large, controllable gas supply of about 580,000 M.c.f. daily enables the companies to handle a peak daily load of 1,700,000 M.c.f. when interruptible customers are cut off.

Import war council called

Domestic-oil producers from all over the nation will meet in Washington this week at the invitation of the I.P.A.A. to map an all-out campaign for a quota on foreign oil imports. The parley comes on the heels of assurances from Secretary of State John Foster Dulles that the administration intends to keep one eye on the interests of domestic industries when it exercises its powers under reciprocal trade agreements. Dulles insists that imports are not at fault, but "free trade" between the states is causing trouble for the producers.

Income overbalances costs

The President has asked Congress for $31 million for the coming fiscal year to handle the Government's oil and gas activities. This is well overbalanced by the federal taxes on oil and oil products which will bring in more than $1 billion. In addition to this, the Government income from the Continental Shelf leasing is estimated by Eisenhower at more than $100 million for 1956. The budget request includes funds—ignored by Congress last year—for the FPC's regulation of natural-gas producers.

MID-CONTINENT'S 64,000-bbl. refinery at Tulsa is one of major facilities sought by Sunray.

Sunray Woos Mid-Continent

- Serious consolidation talks reach stage which could bring merger of two big, thriving Tulsa oil companies
- Sunray production and Mid-Continent refining would create $474 million firm, ranking fourteenth in U. S.

TULSA. — Flirtatious glances being exchanged by Sunray Oil Corp. and Mid-Continent Petroleum Corp. may lead to one of the industry's greatest mergers since the Socony-Vacuum nuptials in 1932.

Sunray, which has been doing most of the wooing, would like to set up housekeeping with Mid-Continent in the luxurious 12-story Sunray building recently completed in Tulsa. The building has four floors vacant—a fact which has caused considerable speculation regarding its plans for expansion.

Principals in the romance have indicated the courtship probably will be short. Mid-Continent is expected to accept Sunray's proposal without much delay, or else call the whole thing off.

Union of Sunray and Mid-Continent would create a robust company with total assets of about $474,000,000. According to latest annual reports, the resulting firm would rank fourteenth in size among oil companies operating in the United States.

The prospective consolidation offers advantages to both companies. Sunray produces more crude than it refines, and Mid-Continent can't supply enough crude to meet its own refining and marketing needs. Consolidation, if it goes through, will unite the assets of a highly successful exploration company with a thriving marketing business which already blankets most of the Mid-Continent area.

Prospects . . . The two companies have much in common. Both have headquarters in Tulsa, both concentrate most of their activity in the Mid-Continent, and both are thriving.

Current reports indicate the merger would cause little shakeup in personnel or operating procedure. Headquarters of the new firm likely would move to the new Sunray building, with refining and marketing offices being maintained in the present Mid-Continent building a few blocks away.

Plans call for keeping at least the Sunray name. "Mid-Continent" or "D-X," the marketing symbol, may be added.

Mid-Continent has had other suitors and reportedly has had at least one other merger proposal. But the earlier negotiations were less publicized and apparently were not so fervent.

First public announcement of the

How They Compare

	Sunray	Mid-Continent
Assets	$292,338,925	$181,776,131
Gross operating income	$133,168,828	$174,454,915
Net operating income	$27,572,827	$14,394,239
Crude production, bbl.	25,502,404	7,031,030
Refinery throughput, bbl.	14,388,466	21,214,444
Producing oil and gas wells	3,437	2,341
Bulk and service stations	5	2,715
Miles in pipeline system	290	1,998

All figures from 1953 annual reports.

MID-CONTINENT'S McDOWELL

current negotiations came when the Mid-Continent board was meeting in New York last weekend. Both C. H. Wright, Sunray chairman, and R. W. McDowell, Mid-Continent president, confirmed reports that a possible merger of the two companies had been discussed.

Other top officials of the companies are Jacob France, veteran chairman of the Mid-Continent board; F. B. Parriott, chairman of Sunray's executive committee; and W. C. Whaley, Sunray president.

Key men . . . Mergers are not a novelty to Sunray Oil Corp. Since its organization in 1920, Sunray has been keenly alert to the possibilities of increasing its own stature by pooling resources with other companies.

The man who has done most of the tugging on Sunray's bootstraps is Clarence Herman Wright, chairman of the board and former president of the company.

Wright, who is handling current negotiations for Sunray, is largely responsible for the company's rapid growth in recent years. His first big deal for Sunray was in 1950, when directors approved the transaction he negotiated for the purchase of about 800,000 shares of common stock in Barnsdall Oil Co. This led to Sunray's absorption of Barnsdall, and it put Sunray in the oil industry's big league. The transaction cost Sunray $44,000,000 in cash.

The other top figure in current negotiations is Robert W. McDowell, fast-moving president of the traditionally conservative Mid-Continent company.

McDowell, now 59, has been a member of the D-X organization since October 1927, when Mid-Continent acquired the consolidated Hawkeye and Black Hawk Oil Cos. at Waterloo, Iowa. McDowell, president of the Iowa organization, became manager of Mid-Continent's newly created northern sales division.

He moved to the company's headquarters at Tulsa in May 1928 as assistant to D. W. Moffit, then vice president in charge of sales.

McDowell was named sales manager in December of the same year. In August 1930, at the age of 35, McDowell was promoted to vice president in charge of sales. He moved on up to executive vice president of the company in 1947 and was named president 2 years later.

Sale near? . . . Although spokesmen for both companies persistently denied that a merger agreement had been reached, financial circles buzzed last week with rumors that sale of Mid-Continent was near. Informed sources both in Tulsa and in Wall Street indicated general terms of the transaction may be agreed on by heads of the two companies early this week.

Reports of the proposed merger stirred Wall Street for several days before company spokesmen confirmed the fact that consolidation was being discussed.

Company stock began to seesaw. Mid-Continent common stock jumped from $101 a share January 12 to $108.50 on January 14. Sunray faltered momentarily, then started a gradual climb as it became the most active on the New York Stock Exchange. By the end of the week, Mid-Continent had dropped back to about $105.50. Sunray was still selling briskly after rising from $24.50 to $26.25 within a week.

Likely terms . . . Best bet on terms of the transaction, if it goes through, is that Sunray will pay Mid-Continent stockholders with its own common stock, cash, and possibly some senior securities.

Final decision on the Sunray offer apparently will be made by the Boston interests which now have effective control of Mid-Continent. This group, which includes the Massachusetts Investment Trust and the State Street Trust Co., has been adding gradually to its holdings of Mid-Continent stock for the past year or longer.

Mid-Continent has 1,863,000 shares of stock outstanding. The company's last annual report listed $63,448,878 in working capital at the end of 1953. Of this, $42,468,160 was held in cash. Mid-Continent has no long-term debt or preferred stock.

In December, Mid-Continent's management proposed a four-for-one split of the company's stock. Stockholders are scheduled to vote on this proposal at a special meeting February 15.

SUNRAY'S WRIGHT

Under this plan, Mid-Continent stockholders would receive three additional shares for each one now held. Barring sharp changes in price, Mid-Continent's stock would then be roughly equal in price to Sunray stock.

Sunray's outstanding stock numbers 10,492,400 shares. As of December 1, 1954, its long-term debt was $73,533,-333. There are two issues of Sunray preferred, one of which—the convertible second preferred—is being called for redemption. The other issue consists of 688,800 shares of Series A, 4¼ per cent, $25 par value.

Finances . . . In the first 9 months of 1954, Mid-Continent grossed $122,-276,000, placing it among the top 20 oil companies in the United States. For the same period, Sunray reported gross income totaling $94,200,000.

Sunray's net income for the first three quarters of 1954, however, was considerably greater than Mid-Continent's. Sunray netted $15,900,000 as compared to Mid-Continent's $9,795,-000.

Mid-Continent's net earnings for the 9-month period amounted to $5.25 per share of common stock. Sunray's net averaged $1.51 per share.

Operations of the two companies would wedge neatly under one administration.

Assets . . . Mid-Continent, with a relatively small crude production of about 7,000,000 bbl. yearly, owns or controls more than 2,700 service stations and bulk plants. Its D-X gasoline is sold in 15 central and northern states, and its lube oil is distributed from Nevada to Michigan.

The New York consulting firm, John S. Herold, Inc., recently estimated the company's reserves at 85,000,000 bbl.

FOUR FLOORS in Sunray's new building are unoccupied. Mid-Continent could move in.

of crude oil and 500 billion cubic feet of natural gas.

Sunray, which has shied away from the marketing business in the past, normally produces more than 24,000,000 bbl. of crude oil annually. It has proved reserves totaling about 359,000,000 bbl. of liquid hydrocarbons, including crude oil.

Both companies operate large refineries. Mid-Continent's Tulsa plant, largest in Oklahoma, has a crude capacity of 64,000 bbl. per day. Sunray operates a refinery near Duncan, Okla., which has a daily capacity of about 33,600 bbl., and it owns a smaller refinery, now shut down, at Allen, Okla. The company also has 50 per cent interest in Suntide Refining Co., which operates a 35,000-bbl. plant at Corpus Christi.

Pipelines . . . An important factor in the merger proposal is a new 475-mile products pipeline extending from Sunray's Oklahoma refineries to the Mississippi River at West Memphis, Ark. The $21,000,000 project, in which Sunray owns half interest, can move up to 44,000 bbl. of products daily to the Mississippi River for reshipment to the large marketing areas.

Oklahoma-Mississippi River Products Line, Inc., operator of the system, also has an 84-mile tributary line serving refineries in northern Oklahoma. Since completion of the line, Mid-Continent has become one of the system's major clients. The company now moves large quantities of products from its Tulsa refinery to eastern Arkansas, where it has opened a new marketing area.

Major outlet for Mid-Continent's refined products is the Great Lakes Pipe Line Co. system, which includes more than 5,000 miles of pipeline extending from Oklahoma northward to Kansas City, Omaha, Des Moines, Minneapolis, Chicago, and other major cities. Mid-Continent has a 19 per cent interest in Great Lakes.

In addition, its subsidiary, Mid-Continent Pipe Line Co., operates 1,998 miles of crude lines, according to latest figures available.

Sunray holdings . . . Other major Sunray holdings include about 23 per cent interest in Westcoast Transmission Co., Ltd.; 52½ per cent interest in Ucan Products Co.; and minority interests in Peace River Natural Gas Co., and Pacific Petroleums, Ltd. The company's wholly owned subsidiary, Sunray Oil Co., produced more than 120,000 bbl. of oil in Canada last year and has an interest in vast unexplored areas.

At the start of 1954, Sunray had 3,441 net oil and gas wells in 14 states and Canada. In addition, it has a relatively small interest in American Independent Oil Co., which holds a highly productive concession in the Neutral Zone between Kuwait and Saudi Arabia.

Undeveloped acreage under lease to Sunray totals about 2,000,000 acres and is located in 20 states.

New Tool Tested

Electric rotary-percussion drilling unit gets tests

LOS ANGELES.—A new electric rotary-percussion type drilling tool operating in a surface test was demonstrated at Simi, near here last week.

The new tool, slightly over 15 ft. in length and installed between the drill collar and bit, made use of a standard rotary bit as well as other standard rotary equipment.

Electrical power was used to drive the tool, which has only two moving parts. In oil-well drilling, power would be conducted through a system of patented cable and pressure connectors which extend through the drill pipe. These would be secured in the pipe to permit make up of the connectors automatically with the addition of each length of drill pipe. The tool was developed by American Percussion Tool Co.

No hole has been drilled other than surface tests in blocks of granite. Tests to date have drilled 15 ft. per hour in such hard drilling, the tool's developers claimed. They also said the hard rock cuttings were reduced to about 200 mesh, which would make their removal by the circulated mud stream easier.

The demonstration was with a 12¾-in. tool. One having a diameter of about 7-in. is under construction and will be used soon for below surface drilling in the Simi Valley area.

Crude Production Down

WASHINGTON.—Crude petroleum production in 1954 dropped 2 per cent below the 1953 output, the Bureau of Mines estimated last week. The cash effect of the decline, however, was softened by an increase in average price from $2.68 to $2.76.

The bureau estimated 1954 crude production at 2,314,000,000 bbl. worth $6,387,000,000 at the wells.

Natural gasoline production equaled the 1953 output of 127,000,000 bbl., but the average value for 1954 was nearly 1 cent per gallon less than the 1953 average of 7.6 cents, the bureau said.

Liquefied petroleum gas production increased 7 per cent to 120,000,000 bbl., but the average price of 4 cents per gallon was slightly below that of 1953.

The marketed production of natural gas increased to 8,700 billion cubic feet. The value continued to rise, averaging 10 cents per M.c.f. compared to 9.2 cents in 1953.

FPC is New Legal Will-o'-the-wisp

Industry lawyers are having trouble getting agency into court to test the validity of its gas price orders

. . . and they believe the federal power commission has plotted the you-can't-get-there-from-here legal maze

Henry D. Ralph

TULSA.—Nobody knows how to get the Federal Power Commission into court to test the strength of its orders against independent gas producers.

What's more, there is a strong presumption—though no legal proof—that the commission or its staff deliberately planned it that way.

It looks like a deep-laid plot to prevent any form of judicial review for many months, to keep all producing and gathering activities under FPC control, and prevent any important increases in gas prices at least until after the present session of Congress.

So far the commission has successfully prevented any court consideration of producers' charges that FPC Orders 174-A and 174-B are illegal or go beyond the scope of the law as interpreted by the Supreme Court in the Phillips case. Several cases are pending in which producers hope to get such a court review. But it appears the commission is prepared to use every possible legal maneuver to prevent final action.

A scheme? . . . The scheme, as industry attorneys conceive it, is to stall off amendments to the Natural Gas Act and maintain the status quo. All producers will stay under federal control, the producing and gathering industry will be conducted as in the past, gas will continue to be delivered to interstate lines, and prices will be held down.

Then the supporters of federal control can tell Congress and the public that there was nothing to the screams and threats of the producers that regulation would keep gas out of interstate commerce, dry up supplies, stop exploration, and force consumers to pay higher prices for less gas. The longer Congress can be stalled off, so the reasoning goes, the easier it will be to keep the act from being amended.

On the other hand, once Order 174-B gets into court, FPC's powers are almost certain to be whittled down—and the commission's attorneys apparently realize that very well. Producers can raise dozens of legal points and factual situations which should make almost any court in the land take a close and critical look at what FPC is trying to do.

Gas producers whose operations are far different from those of Phillips Petroleum Co. which were before the Supreme Court—and that includes about 99 per cent of them—are confident that they can get the courts to set aside large portions of 174-B as applied to them.

The hurdle . . . The trouble is getting to court.

It's a basic principle of Anglo-Saxon law that any citizen aggrieved by the action of a government agency can tell his troubles to a court and get some relief if he can show that the agency is exceeding the authority given it by law. But, under the American doctrine of separation of powers the courts are reluctant to interfere with the executive branch except in flagrant and clear-cut cases.

As a result, the statutes and precedents for haling FPC before the bar to answer for its actions are hazy, to use a charitable term.

Attorneys for the oil and gas industry have set out to make some new law on the subject. If they succeed it will be over the dead body of FPC's legal staff.

Stripped of most of the legal technicalities, here's the way the plot has operated to date:

FPC's first order . . . No. 174, issued about 5 weeks after the Supreme Court decision in the Phillips case, was a blanket, inclusive order purporting to cover nearly all activities of nearly all producers. There is considerable evidence that this draft had been ready in the FPC files since 1949 (and possibly since 1941). For one thing, it contained some language which Congress removed from the Natural Gas Act in 1942.

This, plus other bits of history, support the thesis that at least a faction of the FPC decided to control the whole producing end of the gas business a long time ago.

The second . . . Within 3 weeks, and before the dumbfounded producers could collect their legal wits and take any action, FPC rectified this tactless error by superseding it with Order 174-A.

Both orders were issued without notice and hearing, a circumstance which would make them illegal unless they were either emergency orders or purely procedural rules not affecting anybody's rights. FPC says they were both. The industry says they were neither. The courts haven't had a chance to say what they think.

When producers started to run for the courts, FPC scheduled a hearing on 174-A. Then it took the position that producers had no standing in court because the order wasn't final and might be changed after the hearing.

The third . . . The hearing was held and producers by the dozen told FPC how wrong its order was. But when the order was rewritten and reissued as 174-B it was found to have been changed hardly at all. Producers say it is still illegal in many ways as applied to their operations.

Now, most attorneys believe, 174-B is a "final" order. That should mean that any aggrieved party can take an appeal directly to a federal Circuit Court. At least that's what Section 19 of the Natural Gas Act appears to say.

But when they get to a Circuit Court they are met by FPC attorneys who say that 174-B is not appealable because it is purely a procedural order. They say that 174-B simply explains to producers how to proceed under the law if they wish to comply with it, and that the complaining producers haven't been hurt by it because they, specifically, haven't been mentioned by name.

Of course this blandly ignores the fact that under 174-B the commission is requiring producers to file certificates—which they say is not required by the act; is setting aside price provisions of their contracts—which they

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Colorado Board Objects

DENVER.—The Colorado Oil and Gas Conservation Commission has called for congressional action to "correct" a U. S. Supreme Court ruling last June which empowered the FPC to control natural gas prices or independent producers.

A sharply-worded resolution adopted by the commission says "such Federal Power Commission jurisdiction of sales of natural gas produced in Colorado adversely affects the conservation of oil and gas within this state." The resolution also says the Supreme Court ruling "threatens the jurisdiction of this commission over the conservation of the natural gas and oil resources in this state."

say the law never contemplated; and is taking a lot of other actions which they say are completely illegal.

But 174-B contains language which describes itself as procedural, and FPC lawyers are banking on this to scare off review by the federal courts.

The fast one . . . Two companies—Magnolia and Ohio Oil—pulled a fast one. As soon as 174-A was issued they applied for relief at the Fifth Circuit Court in New Orleans. Before FPC heard about it, one of the judges issued temporary stay orders, preventing FPC from enforcing 174-A against these two companies until he could get around to hearing the facts involved. A couple of days later when Superior Oil Co. asked for a similar injunction from the same judge, it got turned down.

When Amerada Petroleum Co. asked the Tenth Circuit Court in Denver for an injunction, the FPC man was on the spot with the procedural argument, and Amerada lost. The cases of all these companies, plus some others, are still pending in these circuit courts, but when they come up for hearings the FPC will expound the legal fiction that 174-B isn't reviewable because it doesn't hurt anybody.

The end run . . . Foreseeing these blocking tactics, Union Producing Co. tried an end run, and at least got as far as the line of scrimmage. It sued the five FPC commissioners as individuals in the District of Columbia, where they reside. Its argument was that as individuals the commissioners had gone beyond the authority given them by Congress and therefore they should be held accountable in court.

An amazing thing happened. Attorneys for FPC argued that Union Producing was in the wrong court because the Natural Gas Act specified that appeals should be taken directly to the federal circuit courts—exactly the opposite from what FPC was telling the circuit courts at the same time.

Unfortunately for FPC, this case came before testy Judge Holtzoff, who has had considerable experience with the ways and wiles of federal administrative agencies. In a scathing opinion highly critical of the messed-up status of administrative law, he said:

"Counsel for the commission candidly concede that if the plaintiff sought to invoke this remedy (appeal to a circuit court) they would then assert that the plaintiff has no standing to pursue it."

He issued a preliminary injunction preventing FPC from enforcing 174-B against Union Producing pending a further hearing before his court. What the final outcome will be remains to be seen. If Union wins, the way will be open for any producer to do the same—provided he and his legal staff care to spend a few months in Washington.

The Stanolind try . . . A novel way out of this dilemma is being tried by Stanolind Oil & Gas Co. It brought suit against the United States of America—not the Federal Power Commission—in the federal district court in Tulsa, its home town. What makes it novel is that a rule of law says that a "sovereign"—in this case the federal Government—can't be sued without its consent.

At the hearing last week Stanolind offered a mass of legal argument to get around this point. It also pointed out that FPC has made it impossible to go to the circuit courts and that it would be a denial of justice to force all producers to bring action against the commissioners personally in far-off Washington.

Not being a party to the Stanolind case, FPC had no spokesman present. But—most interestingly—the special assistant to the Attorney General who came from Washington to represent the Government argued that Stanolind has the right to appeal directly to a federal circuit court if it thinks 174-B is illegal or doesn't apply to certain of its gas operations.

Federal Judge Savage wryly asked if the right hand didn't know what the left hand is doing in Washington. He took the case under advisement and gave the Government time to file a brief. His decision should be forthcoming within a week or two.

If Stanolind wins an injunction, the dam will be broken. There are more than a dozen federal district courts in the southwestern states where the bulk of the gas producers operate. If producers can get FPC off their backs simply by applying to the nearest federal courthouse, Order 174-A may soon look like a sieve.

That's why all oil and gas lawyers are watching Stanolind's case in Tulsa.

What FPC wants . . . What FPC wants each producer to do is to apply directly to it for a specific order spelling out to what extent 174-B applies to each of his many operations and sales contracts. Then, says FPC, a producer can appeal to a circuit court if he doesn't like the outcome.

Naturally, this would take months, even years, because the commission would hold lengthy hearings on each case. But even this procedure is full of legal pitfalls. FPC has its own peculiar rules of practice—some of them unwritten—many of which are different from those used by the courts and other administrative agencies. Under these rules, the lawyers say, an unwary litigant might submit evidence which would be entirely acceptable anywhere else but would find his case thrown out because he didn't follow the right procedure.

So the FPC has you coming or going. No matter where you are, you can't get there from here. Industry lawyers think it's all a diabolic plot, worked out long ago, to keep FPC out of the courts so long that it will have federal regulation firmly clamped on producers before the legislative and judicial branches become sufficiently aware of the situation to do anything very effective about it.

Nationalization Coming?

DALLAS.—Nationalization of all natural resources of this country is almost sure to result if the Supreme Court's holding in the renown "Phillips case" is allowed to stand.

This was the warning recently handed to approximately a thousand of the country's experts on oil and gas law by Gen. E. O. Thompson, member of the Texas Railroad Commission. Thompson told the opening session of the Sixth Annual Institute of Oil and Gas Taxation meeting on the Southern Methodist University campus that the FPC orders threaten to completely wreck the carefully built state petroleum conservation structures.

Financing Road is Rocky

WASHINGTON.—The natural-gas industry will find it difficult to secure financing as long as there is uncertainty over federal regulation of independent producers, Rep. Oren Harris of Arkansas warned the House last week.

Harris, ranking member of the House interstate commerce committee said financial institutions will not lend money and producers cannot be expected to take the exploration risk unless the situation is cleared up.

All the financial representatives who spoke before the Federal Power Commission last week stressed this point, Harris said.

The Prudential Insurance Co., with some $287,000,000 in debt obligations of producers and transmission companies, warned it would not extend further credit as long as the extent and character of regulations is uncertain, Harris said. A similar warning was voiced by a Chicago banker, who estimated that commercial banks have a total stake of more than $1,000,000,000 in gas loans.

Pipeline Contractors Like What's Ahead

Paul Reed and D. H. Stormont

LOS ANGELES.—Pipeliners expect big things in 1955.

Optimism was expressed by all speakers at the seventh annual meeting of the Pipe Line Contractors Association here. The only note of concern was sounded by H. C. Price, Bartlesville, Okla., contractor and newly elected association president.

Price's predictions of 1955 were rosy, but he cautioned against a menace that threatens all phases of the oil and gas industry—the Phillips case. Price said if legislation is passed to eliminate Federal Power Commission control of natural-gas production you "may anticipate that 1955 will be the most active and successful year in the history of the industry."

Much was said of 36-in. pipe, the problems of laying such pipe, and the ways of solving these problems. Canada and its plans for several big lines also captured a big share of the spotlight.

Domestic activity . . . G. Austin Manuel, president of Williams-Austin Co., Pittsburg, and outgoing association president, said cross-country pipelines definitely in sight in the United States for 1955 total 14,000 miles. He said there also should be many more miles of pipe involved in deals that have not been announced.

Manuel said contractors should have no trouble meeting the big workload of the projects. He said the association's survey of last year showed there were 66 spreads of equipment for pipe under 20 in. in diameter and 54 spreads for big-inch pipe. These spreads represent an investment of $100 million.

For 1955, contractors will have 66 little-inch spreads and 71 big-inch spreads ready.

The 36-in. story . . . Building the first 36-in. diameter pipeline was discussed from the company angle by Raymond H. Crowe, chief engineer, Transcontinental Gas Pipe Line Corp., and from the contractor's viewpoint by John Gay, of Associated Pipe Line Contractors.

The economic significance of entering the era of large-diameter pipe was cited by Crowe's comparisons which showed that a 36-in. pipe will carry 1.6 times as much gas as a 30-in. pipe for the same pressure drop.

Transco, the pioneer of 36-in. pipe in natural-gas transmission, plans extensive 36-in. looping of its system. The company is applying for FPC approval to build 330 miles in 36-in. loops.

Crowe said the "sewer-pipe" method of construction adopted in laying the 36-in. pipe filled Transco's needs both from the standpoint of lining up the pipe and making the pipe fit the hole. He said, however, that a more narrow ditch could probably be used for lining up the pipe. On the other hand, he said the wider width eliminated bridging.

H. C. PRICE
New Pipeliners' President

One problem met in the Transco job —damaging coating getting pipe in and out of the bending machine—is being overcome, Crowe said. He said bending machines with rubber rollers are being developed to sidestep this problem.

Gay predicted a 60-in. ditcher will be developed for laying 36-in. pipe. This will solve another problem developed in the Transco job. The ditch was dug with back hoes since ditchers capable of doing the job were not available. The ditch was 5 to 6 ft. wide at bottom and 7 to 8 ft. at the top.

He said laying the 36-in. line progressed at about 2,400 ft. daily under favorable conditions.

Canada . . . The big role Canada will play in pipelining was outlined by N. E. Tanner, president of Trans-Canada Pipe Lines, Ltd. He said the combination of Canada's abundance of natural gas and the ever-increasing market make it certain that pipeliners will be spending more time in Canada.

Tanner said crude pipelines also face a bright future in Canada. Only one well is being drilled for each 178 sq. miles in Canada. He said this density is only one-fifth that of the U. S., adding that "we can drill 15 times the

SINCE TRANSCONTINENTAL GAS Pipe Line Corp. proved last summer that 36-in. natural-gas line can be profitable, contractors have been looking at their hole card to see how well prepared they were to handle it. Caterpillar Tractor Co. has come up with its No. 538 Pipelayer, which the firm believes will handle the giant pipe easily. No. 538 was field tested recently by R. H. Fulton & Co. on a job for Panhandle Eastern Pipe Line Co. The pipe used on the field test was only 30-in., but the company was able to determine how the machine would handle 36-in.

number of wells we have drilled before we reach the state of development now obtained in the U. S."

Canada's proved oil reserve is now set at 2.8 billion barrels and the natural-gas reserve at 13.4 trillion cubic feet. The gas figure is growing at the rate of 1.3 trillion cubit feet annually.

Tanner pointed out three big pipelines will be started in Canada this year. They include his company's 2,250 mile, 30 and 34-in. line from Alberta to Eastern Canada, the Alberta Gas Trunk Line that will feed gas into Trans-Canada, and Westcoast Transmission Co., Ltd.'s $100,000,000 gas line from the Peace River area to Vancouver. The latter is linked with the Pacific Northwest Pipeline project that should be kicked off in the U. S. this year.

"It is evident, as a result of these three major projects, together with the many necessary gathering and distributing lines, that there will be a tremendous construction program within the next 2 or 3 years."

Tanner said the network of pipelines will lead to more exploration along with opening wells that have been shut in due to lack of transmission facilities.

The Trans-Canada president went even further. He said if the fast-pace of development in Canada continues, another line similar to Trans-Canada will be justified in another 4 years.

R. A. MacKimmie, partner in Allen, MacKimmie, Mathews & Wood, Calgary, gave the pipeliners some tips on how to operate in Canada.

In regard to taxes, he warned that all equipment—whether brought into Canada or bought there—is taxed and that the tax averages 33 per cent of total cost for duty and sales taxes. He said some concessions might be granted for equipment not manufactured or available in Canada.

The smart contractor will have administrative personnel in Canada well in advance of operations to discuss with the National Employment Service and the Department of Immigration the matter of bringing skilled workmen into Canada. The transfer of such personnel is restricted by availability of those in Canada who are qualified.

Accidents . . . More accidents occur on the right of way than in any other type of pipeline construction, according to John H. Williams, Williams Bros. Co., Tulsa, who reported on the association's safety program.

The right of way mishaps account for 17.6 per cent of the accidents, according to a survey covering approximately 9 million man-hours of work during the last half of 1954. Ranking behind right of way accidents are pipe gang, welding, and dope operations, which each account for about 14 per cent of the accidents. Eye operations made up 63 per cent of the accidents in welding gangs and 23.5 per cent in the dope gangs. Twenty per cent of the right of way accidents were caused by poor handling of tools.

Officers . . . Other officers elected include C. C. Bledsoe, Midwestern Constructors, Inc., Tulsa, first vice president; Earl Allen, Associated Pipe Line Contractors, Inc., Houston, second vice president; John H. Williams, Tulsa, treasurer; and Richard A. Gump, Dallas, re-elected executive secretary.

New directors are Allen; R. A. Conyes, Conyes Construction Corp., San Pablo, Calif.; R. P. Gregory, Houston Contracting Co.; and Manuel.

Directors with another year to serve are O. R. Burden, O. R. Burden Construction Corp., Tulsa; N. K. McFarland, Lone Star Constructors, Dallas; Ray L. Smith, Jr., Ray L. Smith & Son, Inc., El Dorado, Kans.; Williams; and James P. Neill, Western Pipe Line Constructors, Inc., Austin.

Patent decision reopens . . .

Geochemical Research

F. Lawrence Resen

HOUSTON.—The U. S. Fifth Circuit Court of Appeals has given the green light to increased development in the geochemical prospecting field.

The court declared two patents invalid and paved the way for research which may determine conclusively whether gas seepage can be used as another means of locating oil and gas fields.

The two patents specifically involved were issued to E. E. Rosaire and Leo Horvitz. The first, "Geophysical Prospecting Method," is a method of prospecting for oil and gas by collecting surface soil samples and analyzing the samples for hydrocarbons which might be related to an underground petroleum deposit.

The second, "Geochemical Well Logging," is a method of logging wells to predict the existence of oil and gas bearing formations before they are encountered by the drill bit. It involves analyzing cores or cutting samples for hydrocarbons, carbon monoxide, hydrogen and other constituents found in or near oil and gas accumulations and correlating the concentrations with depth.

The lawsuit . . . Invalidation of the patents came as the outgrowth of a suit Rosaire filed against Baroid Sales Division, National Lead Co. Similar suits were also filed against Core Laboratories, Inc. and Rotary Engineers which offer mud logging service. Rosaire contended detection of gas in drill cuttings by Baroid as a part of its Well Logging Service infringed his patents.

As part of its service, Baroid collects sample cuttings from a shale shaker and then uses a hot-wire gas detector to detect gases entrapped in the cuttings. This is done by placing the cuttings under water in a Waring blender and detecting the presence of the gases as they are released as a result of the agitation. The Baroid method merely detects the presence of gases, but the Rosaire-Horvitz method determines concentrations as well.

Patents invalid . . . A federal District Court earlier decided Baroid did not infringe on the patents and said the patents themselves were invalid. The Appellate Court decision involved only the validity of the patents.

The Circuit Court ruled the patents were invalid because of prior art, particularly an article by Dr. A. Graf in the German magazine, Oel, Kohle, Erdoel, Teer in 1935, which was not considered by the patent office.

Additional weight was given to work carried out by A. J. Teplitz and associates for Gulf Research & Development Co. in 1935 and early 1936. Teplitz and his co-workers used the same methods patented by Rosaire and Horvitz before the two men made any formal claims to the methods.

Texas test . . . The court found that Teplitz spent more than a year in the oil fields around Palestine, Texas, taking and analyzing samples both from the surface and drill holes exactly as called for in the patent claims. The court said this work was a successful and adequate field trial of the prospecting method. The work was performed in the field under ordinary conditions without any deliberate attempt at concealment or effort to exclude the public and without any instructions of secrecy to employes on the job.

Although interest in the geochemical field has lagged since World War II, research in the environmental setting of oil fields has been continuing. With the track now clear renewed interest may make geochemical prospecting a practical tool.

Refinery Contracts Rumored

NEW YORK.—Tide Water Associated Oil Co. officials won't say yes or no, but the refinery construction industry is sure it knows who will build units for the company's new 130,000-bbl. East Coast refinery and where.

Delaware City, Del., apparently will be the location and C. F. Braun Co., Alhambra, Calif., will oversee construction. Braun had previously been identified as the engineer for the project.

M. W. Kellogg Co. will probably design a huge Orthoflow cat cracker and Houdry Process Co. is reportedly designing a Houdriformer for the refinery. Ralph M. Parsons Co. is understood to be designing a unit to recover elemental sulfur from the hydrogen sulfide byproduct of Tide Water's sour, imported crudes.

GULF COAST

New Pool In Gulf

Shell has first discovery on new lease off Louisiana

NEW ORLEANS.—Shell Oil Co. has the year's first major oil discovery in the tidelands off Louisiana. It is the 1 State Lease 2590 in South Pass Block 6, Plaquemines Parish, near the mouth of the Mississippi River.

Drilled on acreage leased only 4 months ago, the well flowed 288 bbl. of 33°-gravity oil daily, plus 182,000 cu. ft. of gas, through 10/64-in. choke. Perforations were from 8,337-40 ft., in the Miocene. Tubing pressure was 1,425 psi. and gas-oil ratio 632:1.

The wildcat is the first successful well in the offshore area southeast of the Mississippi River passes. The California Co. and Shell both have prolific production at Main Pass, to the north.

The discovery is believed to have set a new record by cutting the time between purchase of a lease and completion of a well offshore. Shell paid $1,673,000 for 5,000 acres at the Baton Rouge state-lease sale September 15, 1954. Shell's well is the first producer on any of the acreage leased at the September sale.

Second 6-well Unit Ready

LEEVILLE, La.—Crews have completed the installation of a new multiple-well derrick at Bay Marchand near here and it will soon be drilling development wells for The California Co. from its new platform.

Located on the north flank of the huge piercement-type salt dome, the multiple derrick can drill six holes without being skidded. The arrangement of the crown block and guide-sheave assembly, prefabricated "positions" on the fourble level for racking pipe, and on the derrick floor for moving the rotary table and backup post, allow crews to drill three wells each in two rows. The rows are 10 ft. apart. Well locations are spaced at 7½ ft. intervals.

This is the second such unit installed by Calco. The first—the first piece of really new drilling equipment in more than a decade—is located at Main Pass Block 69, off the coast of Plaquemines Parish, Louisiana.

The primary advantage of the six-well rig is that all directional holes can be drilled without the draw works or platform being moved. In addition to the saving in time, much cost of moving is eliminated, and there is no waste of expensive piling. *(The Oil and Gas Journal, January 18, 1954, page 79).*

Journal Index Ready

Your copy of the 1954 Oil and Gas Journal Index is now ready. As in previous years, the index lists all engineering articles and principal news stories of the entire year by subject, geographical area, and author.

To obtain this handy and ready reference to material printed during 1954, merely drop a letter or post card to: Editor, The Oil and Gas Journal, Box 1260, Tulsa.

Gas Fields Have Outlet

ABERDEEN, Miss.—First market outlet for the half dozen shut-in gas fields in northeastern Mississippi's Black Warrior basin is being provided by a connection Texas Eastern Transmission Co. has made from Aberdeen field, northwest of here, to its main line 6 miles to the east.

Gas deliveries are being made by Shell Oil Co. and W. C. Feazell, joint operators in the field, on a basis of approximately 2,000,000 cu. ft. per day from each of the field's three wells. All three have been shut-in since their completion. Well-head price is reported to be 15 cents per thousand cubic feet.

Aberdeen field was discovered early in 1953, at the start of the active wildcatting play which spread over the Black Warrior basin the remainder of that year and early 1954. Most recent well was completed in December 1953.

Only Aberdeen, and Union Producing Co.'s previously discovered Muldon field, 6 miles to the south, with 11 wells completed, have more than the discovery well. All are productive from upper Mississippian sands. *(For geologic details of the Muldon field see page 158).*

Humble Units Get Writeoff

HOUSTON.—Humble Oil & Refining Co. has been granted a certificate of rapid amortization for a catalytic reforming and hydrogenation project at its Baytown, Tex., refinery.

The 18,000-bbl., fixed-bed reformer will employ a platinum catalyst. By-product hydrogen from the reformer will be used in a second unit which will desulfurize feed stocks. This unit will be able to treat 30,875 bbl. daily.

The company received a 65 per cent writeoff on $3,393,500 and 50 per cent of $366,500 on the reformer. On the desulfurizer, it received 65 per cent of $770,500 and 50 per cent of $28,500.

Producing Properties Sold

HOUSTON.—Gulf Coast Leaseholds, Inc. will buy all the outstanding stock and assets of Corpus Christi Exploration Co.

Robert G. Behrman, Jr., president of the Houston firm, said a contract for the purchase was signed last week.

Principal holdings of the exploration company, a wholly-owned subsidiary of Corpus Christi Refining Co., are producing leases in Starr and Reeves counties, Texas, with five oil wells and a shut-in gas well in Victoria County. About 780 acres of leases are involved.

Gulf Coast Leaseholds will continue to buy production and reserves, its president says. The company last year absorbed Hickory Petroleum Corp. and Texas Northern Oil Corp., both small companies.

Isotope Lab Opened

HOUSTON.—The first commercial laboratory to supply radioactive materials to the petroleum industry in Houston has been set up by Tracerlab.

The new laboratory is under direction of Leonard F. Tischler, radiochemist who was transferred to Houston from Richmond, Calif.

The use of radioactivity in exploration, drilling, transportation, and refining operations now constitutes the largest industrial use of artificial isotopes, Dr. Zumwalt Lloyd, technical director of Tracerlab said.

Typical uses of radioisotopes are as tracers to evaluate and control waterflooding; to test oil-well cement around the casing for leaks; to locate precisely the level of an oil or gas pad in salt domes; and to identify drilling mud to determine formation permeability.

Underground storage meets . . .

Peaks in Gas Demand

D. H. Stormont

LOS ANGELES.—"Whipped by icy winds, new rain and snow storms may strike the Southland tomorrow night and Wednesday on the heels of last night's storm which brought nearly an inch of rain to Los Angeles."

This news item, from an evening Los Angeles newspaper, was welcome news to the two gas companies serving the city area. To Southern California Gas Co. and Southern Counties Gas Co. engineers it meant another test of the underground storage system they and their parent company, Pacific Lighting Gas Supply Co., have developed to meet such cold spells.

Supplying the varying hourly demands of 1,912,000 domestic and commercial customers in the Los Angeles basin, plus supplying gas wholesale to the 186,000 customers of San Diego Gas & Electric Co., would be impossible without these auxiliary sources.

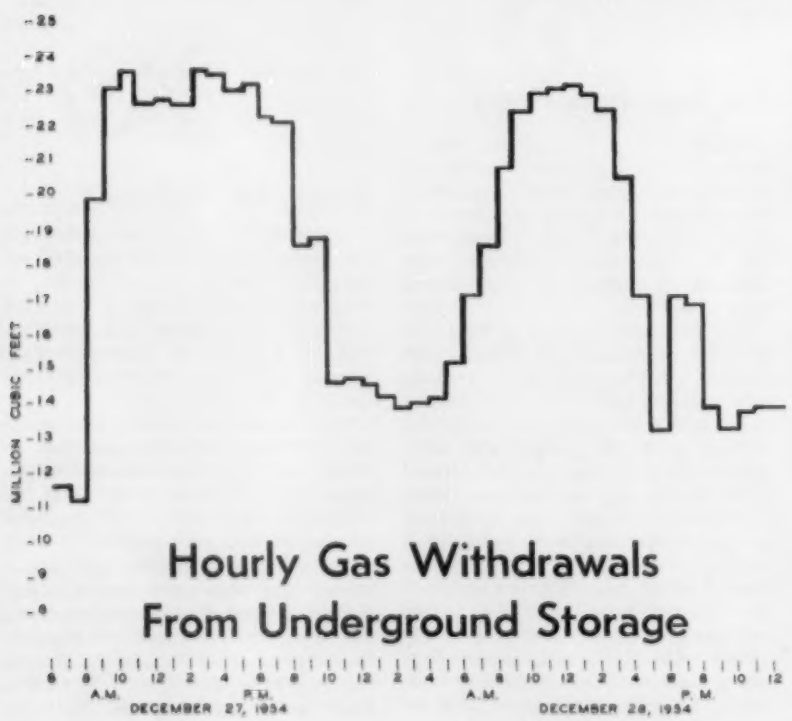
A portion of the industrial demand is interruptible and can be shut off with a few hours' notice. The maximum firm demand, however, is well in excess of supplies available from California fields and from the Texas-California pipeline.

More than 95 per cent of the two companies' local supply is wet gas, which is produced fairly uniformly day after day in conjunction with crude oil. It must be used as it becomes available. Variation in dry-gas production in southern California fields between winter and summer is small, only some 30,000 M.c.f. daily.

Current imports of Texas and New Mexico gas into the area are running about 713,000 M.c.f. daily. Through "packing" the 30-in. portion of the California line during off-peak periods, about 60,000 M.c.f. of gas can be stored for delivery during peak periods.

Last December 27 the consumption was 1,664,000 M.c.f., the largest daily total so far reached. This volume was needed despite some curtailment in supplies to interruptible regular customers, which normally is about 400,000 M.c.f.

How was this load met? Texas gas delivered was about 715,000 M.c.f., California dry gas fields contributed 36,000 cu. ft., and wet gas fields added about 476,000 M.c.f. The four underground storage reservoirs used by the two companies made up the difference, 439,000 M.c.f.



Hourly Gas Withdrawals From Underground Storage

Role of reservoirs . . . The four reservoirs are in the La Goleta, Playa del Rey, Newhall-Potrero, and East Whittier fields. The first is a dry-gas field about 100 miles northwest of Los Angeles. Operated as a temporary storage reservoir since 1941, it is the most important of the four. The other three are in the Los Angeles basin.

The La Goleta project is in a porous sandstone about 300 ft. thick and at a depth of approximately 4,000 ft. It offers means for storing and withdrawing some 10,000,000 M.c.f. of Texas gas annually. Total storage capacity of the reservoir is about 14,000,000 M.c.f., injection capacity 110,000 M.c.f. daily, and deliverability 460,000 M.c.f. daily.

The three fields nearer Los Angeles permit changes in demand to be met quickly. Playa del Rey, about 18 miles west of downtown Los Angeles, has a deliverability of about 120,000 M.c.f. for short periods. East Whittier and Newhall-Potrero are east and northwest of Los Angeles, respectively, a somewhat similar distance. The former has a deliverability of about 15,000 M.c.f. and the latter, 36,000 M.c.f. per day.

With these temporary storage projects, the Pacific Lighting companies can store gas during summer months. During the heavy winter demand season, November through March, they can be called upon to augment the regular sources. This large, controllable gas supply of about 580,000 M.c.f. maximum, enables the two companies to handle a peak load in excess of 1,700,000 M.c.f. daily, with all interruptible loads cut off.

Restraining Writ Appealed

SACRAMENTO.—Richfield Oil Co. and the State Lands Commission in separate actions have petitioned the District Court of Appeals here for a writ of prohibition in connection with the 1,175-acre offshore Rincon lease the commission has awarded the company.

If granted, the action would dismiss a restraining writ issued by the Sacramento Superior Court last December. The writ was granted H. B. Martin of San Diego, who contended the earth and rock filled islands Richfield plans to use are not "filled lands" as defined in the Public Resources Code. *(The Oil and Gas Journal, December 27, 1954, page 114).*

New Scurry Flood Sought

Sharon Ridge Canyon Unit to produce 109,000,000 bbl. of additional oil; is south of Diamond "M" and SACROC

Robert J. Enright

AUSTIN.—Warren Petroleum Corp. and 18 other firms plan to kick off a giant new water-flood program early this summer in the Canyon lime pay formation of Sharon Ridge-Diamond "M" field in Scurry and Borden counties.

The big West Texas project will take in 337 oil wells on almost 13,500 productive acres. It will require an estimated $21,000,000 ultimately for capital and operating expenses. Additional recovery of oil is estimated at 109,000,000 bbl.

Plans for the flood and formation of the Sharon Ridge Canyon Unit were laid before the Texas Railroad Commission for approval last week by L. F. Peterson, consulting engineer, and Raybourne Thompson, attorney for the operators.

The former Sharon Ridge field was discovered in March 1949. Development eventually proved it to be an extension of Diamond "M," and it was combined with the latter in November 1951.

The Sharon Ridge area wells had produced 29,352,860 bbl. of oil, 29,007,400 M.c.f. of casing-head gas, and 3,682,200 bbl. of water by last November 1. The field is substantially developed, with 21 dry holes completed around its perimeter. It is a solution-gas-drive reservoir. Some water is produced around the edge of the field, but there is no effective water drive.

Flood plan . . . Engineering studies, according to Peterson, have shown that the best pressure-maintenance program for the unit would be water injection around the edges of the pool.

The flood plan calls for 31 input wells within the unit area. Others would be operated across the unit line in Diamond "M" to isolate the projected flood from one just beginning to gain momentum in that area (conducted by the Diamond "M" unit and operated by Lion Oil Co.).

There is a possibility, Peterson said, that the operators may want to inject gas at some crestal points in the field in the future, but this will be determined later.

Initially, at least 30,000 bbl. of water daily will be injected into the 6,800-ft. Canyon lime. Present plans call for completion of injection facilities to handle this much by May 1, the date the unit agreement will take effect if approved by the commission. Actual injection would begin within 60 days of that date.

A source of water has been assured via contracts with the Colorado Municipal Water District, the authority which handles the new Lake J. B. Thomas water business.

Peterson said the Sharon Ridge Canyon lime's pressure history proves that it has good communication. He termed the pool one which would readily lend itself to water injection.

Reservoir pressure, originally 8,135 psi. at minus 4,300 ft., averaged 6,688 psi. a year ago at the conclusion of the last pressure survey—a drop of 1,447 psi.

Porosity and permeability, Peterson said, has proved impossible to correlate from well to well on electric logs. Core data from 10 wells (958 core samples) showed average porosity to be 8.8 per cent, average permeability to be 43.9 md., and connate water content to be about 28 per cent.

Oil recoverable from the pool by primary production methods was estimated at 95,000,000 bbl., 14,000,000 bbl. less than the secondary-recovery estimate.

Participation and field rules . . . All operators in the field and 92.23 per cent of the royalty interests have signed the unit agreement.

The agreement provides for sharing unit production under a formula based 50 per cent on gross acre-feet of Canyon Reef formation above the water table and 50 per cent on the well.

Additional fields rules sought by the operator provide for:

. . . Injecting water or gas into the Canyon Reef through any well on the unit after obtaining permission from the commission.

. . . Transferring allowables of producers converted to water supply or water or gas-injection service to other wells on the unit. All or any part of the allowable of a producer which is shut in or restricted for more efficient operation also could be transferred.

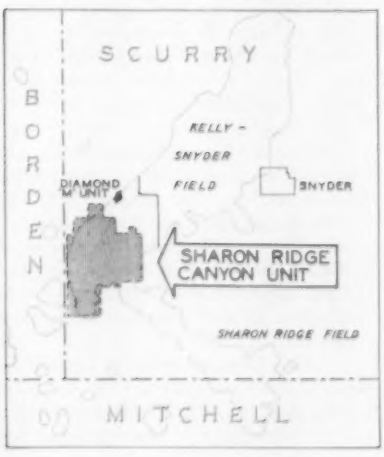
. . . Exempting any producer which is shut in and has had its allowable transferred from commission orders providing for gas-oil ratio surveys or production tests.

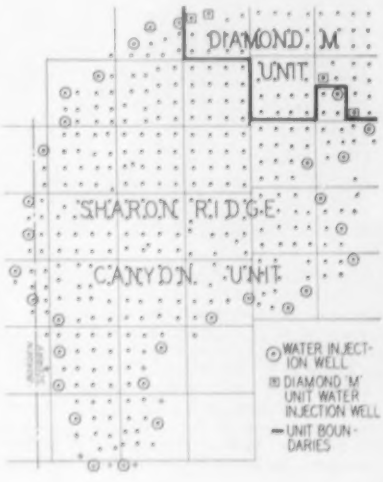
Third Canyon program . . . Sharon Ridge flood will be the third in the Canyon Reef in Scurry County.

One of the other units, Diamond "M" unit, adjoins the proposed new unit and the third unit, the huge SACROC project, adjoins Diamond "M." Together the three units will get a whopping 800,000,000 bbl. or so of oil which otherwise could not have been recovered.

The SACROC operation now going strong in Kelly-Snyder field dwarfs projects usually considered large, taking in almost 50,000 acres and more than 1,200 wells. Additional oil is estimated at around 620,000,000 bbl.

The Diamond "M" unit covers 4,500 acres and more than 100 wells. This pressure-maintenance operation is expected to double primary recovery to about 40 per cent of oil originally in place.





Shell Flood Set

Commission approves plans for Loma Novia injection

AUSTIN.—Shell Oil Co. has received the official Texas Railroad Commission blessing on its projected flood in Loma Novia field of Duval County, South Texas.

Shell will flood the Loma Novia sand underlying its M. C. Hubbard and V. Mendoza leases at 2,700 ft. *(The Oil and Gas Journal, January 3, 1955, page 69).* The company estimates that the 510-acre flood will recover about 1,700,000 bbl. of additional oil from the largely depleted pay sand.

The Loma Novia is considered an excellent prospect for water flooding due to its depletion characteristics, shallow depth, and uniform rock properties. Gas injection has been carried on in the area since 1940, but Shell thinks that less than 30 per cent of total oil in place will be recovered without water injection.

The reservoir has a gas cap but produces under solution-gas drive. Cumulative production is almost 3½-million barrels.

There are 28 producing wells, now making about 174 bbl. of oil, and six gas-injection wells on the two leases.

Shell will convert 16 of the producers and all the gas inputs to water-injection service and inject about 300 bbl. of water daily per well through a closed system on a 10-acre, five-spot pattern. Replacement producers will be drilled for five of the wells marked for input service.

Injection water is to be obtained from the Cole sand at 1,900 ft. and injected at about 250 psi.

Gas-Minimum Asked

Independents back bills before Texas Legislature

AUSTIN, Tex.—If you plan to buy any gas at the well head in Texas, you may soon have to pay a minimum of 7 cents per M.c.f.

Present prices in the state vary. More than 20 per cent of the Hugoton field in the Panhandle is under lifetime contract at 3 cents per M.c.f.

Rep. J. B. Walling, of Wichita Falls, introduced a bill in the Texas House of Representatives last week that would give the Texas Railroad Commission authority to prevent "economic waste" of gas by fixing field prices.

Two similar bills were introduced during a special session of the legislature last spring. Both failed to get out of committee.

Provisions . . . The Walling bill amounts to an amendment of Sections 3 and 6 of the Revised Civil Statutes of Texas.

Section 3 deals with prohibition of waste in production, transportation, and use of natural gas. The new bill (HB 7) would add that the term waste shall include economic waste.

Section 6 would give the Railroad Commission the power to regulate production of gas as it now does oil. Then the commission would be able to determine the value or values required to be received for the gas.

Senate bill . . . Another bill affecting the oil industry was one dealing with water pollution introduced by Sen. D. B. Hardeman.

The bill (SB 4) would require oil and gas operators to post bond of $5,000 for one well or $10,000 for all wells owned to assure that the wells would be plugged and abandoned according to law.

It would also give the commission authority to regulate exploratory operations, including shot and core holes, to prevent water pollution.

SB 4 is one of eight bills concerning water which Hardeman introduced last week. They result from recommendations of the Texas Water Pollution Advisory Council *(The Oil and Gas Journal, October 10, 1954, page 81).*

Two other tax measures that would affect the industry have been talked about but not introduced.

One is the proposal by Gov. Allan Shivers for a 2-cent hike in state gasoline tax to 4 cents.

The other is the often discussed possibility of putting a tax on gas going into interstate pipelines *(The Oil and Gas Journal, December 6, 1954, page 88).*

New Lab Officially Started

John G. Pew, Sun Oil Co. vice president in charge of production, officially launched construction of Sun's production and research and development laboratory at Richardson, Tex., recently when he turned the first spadeful of dirt at the site. The E-shaped, one-story building is slated to be completed in July. Present for the ceremony from Sun's Southwest division at Dallas were, A. S. Rhea, division superintendent, operating department; E. J. Simmons, analytical section head of the production lab; Dr. Frederic H. Lahee, geological and research counselor; Tom F. Hill, assistant division manager; R. E. Rettger, geophysical coordinator; R. F. Millar, head of housing section of civil engineering department; S. M. Gladney, division manager; James A. Waters, chief paleontologist; and F. E. Heath, chief geologist.

Wildcat Misses "Trend"

ABILENE, Tex. — Shows of Cambrian oil, 85 miles southeast of the "Cambrian Trend" in Coke and Nolan counties, have been reported at a rank wildcat in northern San Saba County.

The well is Frank Griggs and Bobby Griffith 1 T. M. Solge (shown as 1 Sofage on West Central and North Texas wildcat map). Location is 9 miles north of Richland Springs, in Section 53½, H&TC Survey.

Field reports said the well had swabbed oil and water from perforations in the Hickory sand at 2,332-42 ft. Top of the Cambrian sand was approximately 2,000 ft. on elevation of 1,370 ft. Hickory was reported at 2,332 ft. and top of the Ellenburger at 670 ft. A fracture treatment was under way at last report.

Nearest production is to the northwest in Coleman and Brown counties. Bronte field in Coke County is the nearest field having Cambrian production.

Texas Stands Firm

February allowable held at high rate despite protests

AUSTIN.—The high January rate of flow from Texas oil wells will be continued during February over the protests of a majority of crude purchasers in the state.

The Texas Railroad Commission last week set the February oil allowable at 3,241,438 bbl. daily.

This was a decrease of only 19,679 bbl. daily from the January 8, rate and was as close to that rate as the commission could set it.

The slight cutback was the result of granting 16 producing days for the short 28-day month of February, compared with 18 producing days for 31-day January.

Fast decision . . . The commission required only 11 minutes to make its decision to hold the line on the high flow rate. Since a large majority of the purchasing companies recommended a much larger cutback in February more evidence was added to the theory that the commission is determined to make a stand against further increases in the oil-import rates.

The majority of the purchasers, including Magnolia Petroleum Co., Gulf Oil Corp., Phillips Petroleum Co., Humble Oil & Refining Co., The Texas Co., Sinclair Oil Corp., Continental Oil Co., and Stanolind Oil Purchasing Co. were for the 15-day allowable, which would have chopped production about 160,000 bbl. from the January 8 rate.

The spread among the other firms nominating, however, was unusually wide. Cities Service Oil Co. asked for only 14 days, while Atlantic Refining Co. nominated a whopping 18.

Texas Depth Record Falls

DALLAS.—Hunt Oil Co. set a new Texas deep-drilling record of 18,625 ft. last week at its 47 Elsinore Royalty Co., 18 miles southwest of Fort Stockton in Pecos County.

The wildcat at this depth was 16 ft. below the previous record set last September by Gulf Oil Corp. at its 1 P. G. Northrup, about 30 miles northwest of the Hunt well.

At last report, the operator was coring in the Ellenburger formation, the projected destination. Nearest Ellenburger production is about 30 miles east in Puckett field *(The Oil and Gas Journal, January 17, page 74).*

The well is being drilled by Penrod Drilling Co., Shreveport. The rig is rated at 15,000 ft. using 4½-in. drill pipe, but hole is now being made with 3½-in. drill pipe. The rig is believed capable of drilling to 20,000 ft. using the smaller pipe.

TXL to Drill First Well

MIDLAND, Tex.—TXL Oil Corp., newly formed as a drilling and producing firm, will drill its first well near a famous predecessor.

The corporation filed application to drill 1 Midland Fee, on 43-41-T2S-T&P Survey ½ mile east of Cities Service Oil Co. and Forest Oil Corp.'s Dora Roberts Ranch field.

A. W. Thompson, Inc., will drill the well for TXL, which was converted into an operating company in December by its trustees and stockholders *(The Oil and Gas Journal, December 20, page 68).*

New Drilling Firm Formed

MIDLAND, Tex.—Lowe Drilling Co. has been formed here to take over the business and equipment formerly operated by Ralph Lowe.

Lowe Drilling acquires 10 gas rotary rigs. President and chairman of the board is C. K. (Ted) Lowe, brother and business associate of Ralph Lowe. W. A. Taylor is vice president in charge of contracts; N. M. Oates, vice president and manager of operations; and J. H. Massie, Jr., treasurer and assistant manager of operations.

The 10 rigs are operated in the Permian basin area of Texas and New Mexico. Four are capable of drilling to 15,000 ft., four to 12,500 ft., and two to 9,000 ft.

ROCKY MOUNTAIN

Tax Refund Denied

Colorado's severance levy will be tested in courts

DENVER.—The Colorado Revenue Department has upheld its tax division in disallowing a refund of $955,-238 in oil and gas severance taxes sought by The California Co.

The company, which calls the tax a gross income tax on production, will file action in district court to test the constitutionality of the levy, which was enacted in 1953. The court test is expected to reach the state supreme court before a final decision is reached.

The company contends the levy represents double taxation and that the state lacks authority to tax production from oil and gas leases on federal lands, such as the firm has in the Rangely field of northwestern Colorado where it is the principal operator.

The department made two concessions in its order denying the California appeal.

It granted a refund of about $6,000 on the value of oil and gas from which no income was derived by the company because it was used as fuel for production purposes. The second concession was a rebate of about $3,000 interest from April 15-25, 1954, a period of time granted the company as an extension on filing its 1953 tax return.

Gasoline Plant Contracted

NEWCASTLE, Wyo.—Black Thunder Oil Co., Rapid City, S. D., has contracted for construction of a $400,000 natural gasoline plant in Wyoming's Clareton oil field where 80,000,000 cu. ft. of gas is being flared daily.

Construction will start immediately, with completion scheduled in 45 to 50 days. The Weston county plant will process 5,000,000 cu. ft. of gas daily. Expected liquid production figures were not disclosed.

Russell Engineering Co., Houston, will build the plant.

U. S. May Settle Lease Tiff

HELENA, Mont.—The U. S. Supreme Court may have to decide just how long oil and gas leases in Montana are good for.

The state is having trouble making up its mind. The legislature in 1953 passed a bill making leases perpetual. In 1954, the state Supreme Court ruled the law null and void and reinstated the 20-year maximum law.

The case will be watched by oil operators everywhere, but especially in North Dakota. There, Gov. Norman Brunsdale has expressed concern over the ruling by the Montana court. The North Dakota Supreme Court unanimously ruled just the opposite years ago, and a decision by the U. S. Supreme Court favoring Montana could upset leasing in North Dakota.

Pointing out the North Dakota Supreme Court decision, Brunsdale said:

"In view of this conflict between the decisions of our two states in construing the same fundamental law, it seems highly desirable that an appeal be taken from the decision of your court to the United States Supreme Court in order that all uncertainty may be removed in both states."

Several Montana legislators also are considering possibilities of introducing new leasing legislation.

Saskatchewan Sets Sale

Eleven tracts in medium-gravity fields offered on bonus basis or royalty deal that is akin to unpopular farmout

REGINA, Sask.—The Saskatchewan Department of Mineral Resources is offering 11 parcels of crown reserve proved and semiproved acreage in the Cantuar and Dollard medium-gravity oil fields in a crown sale February 25.

Bidders may offer cash bonuses for the purchase of leases or sealed offers of net royalty lease agreements with the Saskatchewan Government. The latter is a modification of the farmout agreement which drew a storm of protest from the oil industry when introduced in Saskatchewan last year *(The Oil and Gas Journal, March 29, 1954, page 62)*.

The parcels being offered comprise eight sections in the Cantuar field and three in the Dollard. They are described as follows:

Cantuar field . . . Parcel 109: Section 29-15-16w3, 644 acres, in the southeast corner of the field, east offset to production.

Parcel 110: Section 36-15-17w3, 676 acres, in the southeast corner of the field with production to the east, west and south and a dry hole northeast diagonal offset.

Parcel 111: Section 1-16-17w3, 640 acres, in the southeast corner of the field with production to the north and west and an abandoned well offsetting the southeast corner.

Parcel 112: North half of Section 4-16-17w3, 320 acres, in the southwest corner offsetting production to the east.

Parcel 113: Section 11-16-17w3, 640 acres, in the center of the field with production on four sides.

Parcel 114: Section 16-16-17w3, 640 acres, on the west side of the field with production to the north, east and south and an abandonment offsetting the northwest quarter.

Parcel 115: Section 22-16-17w3, 640 acres, on the north side of the field with production east, west and south and a dry hole offsetting to the north.

Parcel 116: Section 18-16-16w3, 640 acres, on the east side of the field with a dry hole southwest diagonal offset.

Dollard field . . . Parcel 702: Section 3-7-20w3, 639 acres, on the south side of the Dollard field, ½ mile south of the nearest producer.

Parcel 703: Section 12-7-20w3, 640 acres, on the southeast corner of the field, ¼ mile east of production with suspended wells in the northeast and southwest diagonal offset sides.

Parcel 704: Section 16-7-20w3, 640 acres, in the southwest corner of the field with production to the north and east and an abandonment offsetting the southeast quarter.

Net royalty lease . . . The Net royalty petroleum and natural gas lease, offered in this new sale, is a modification of the farmout agreement between the Saskatchewan Government and Consumers' Co-Operative Refineries, Ltd. in the Smiley and Coleville fields.

The chief differences between the net royalty lease and the farmout agreement are:

. . . An actual lease on the acreage concerned will be issued.

. . . Fixed sums are allowed for development, production and operational costs for each well, deductible from gross proceeds during the payout period instead of the adjustable royalty basis found in the farmout agreement.

. . . The government earns no interest in equipment as in the farmout agreement.

. . . The lease is for a period of 21 years, renewable.

Terms of the lease give the government the right of access to the company's books and records concerning the lease acreage and production.

Within 3 months of termination of the lease from any cause, the lessee may remove tools, machinery and buildings erected on the lease acreage but may not remove any casing. Default of this clause means forfeiture of tools, machinery and buildings.

On termination of the lease from any cause the government may take over operation of the well. The crown can acquire use of casing, tubing and production equipment in connection with a well or wells on payment of $1,000 per well.

Trans-Canada Makes Change

CALGARY. — Trans-Canada Pipe Lines, Ltd., has changed its plans and will now build the section of its planned line from Albert to Winnipeg out of 34-in. pipe instead of 36-in.

N. E. Tanner, president of Trans-Canada, said the decision came as a result of recently completed engineering studies. The change will have no effect on the company's plan to export gas from Alberta at the rate of 540 M.M.c.f. daily.

The sizes of the other sections of the line remain the same. They include a 24-in. line from Winnipeg to Emerson, Man.; 30-in. line from Winnipeg to Toronto; 24-in. line from Toronto to Montreal; and a 14-in. lateral from Montreal to Ottawa.

Fourteenth Test Abandoned

OAK LAKE, Man.—Sapphire Petroleums, Ltd., operator for a group of independents which includes Henderson Holdings, Ltd., Select Oils, Ltd., and West Canadian Petroleums, Ltd., has abandoned the fourteenth wildcat in its Manitoba exploratory drilling program, which has so far failed to yield anything but dry holes.

The latest failure is Sapphire East Grande Clairiere 1 in LSD 14, 15-6-24wpm, 12 miles southeast of Oak Lake and 5 miles southwest of the abandoned McCarty and Coleman Morrice 12-28. The contractor, Commonwealth Drilling Co., tested down to 2,762 ft. in the base of the Mississippian formation.

Sapphire has not announced plans for any further wells in the immediate future.

West Pembina Extended

EDMONTON. — Extension of the West Pembina field is assured by Hudson's Bay Oil & Gas Co., Ltd., at its 1 West Pembina. The well produced at the rate of 140 bbl. of oil per day on initial test.

Located at the west side of the huge Pembina oil area, the well is producing from the Cardium sand. It is in LSD 6, 34-47-10w5, about 3 miles southwest of the Stanolind Oil & Gas Co.-Hudson's Bay E-1 Cardium discovery. The new producer is on a spread of lands subject to a 3½ per cent gross override royalty to the team of Seaboard-Honolulu-Merrill-Cancoll.

Stanolind and Hudson's Bay also have completed two more big producers in the Pembina field.

Their Pembina Crown F-17 hit the Cardium sand at 5,258 ft. and flowed oil at the calculated rate of 720 bbl. per day through 24/64-in. choke. The F-22 topped the Cardium at 5,366 ft. and flowed 492 bbl. of oil in 13 hours through 30/64-in. choke for a calculated potential of 920 bbl. per day.

Stanolind announced it has staked

location for a wildcat about 125 miles northwest of Edmonton and 30 miles southeast of production in the Gilwood area.

Alida Wells Planned

Imperial moves three rigs into Saskatchewan field

REGINA.—Imperial Oil, Ltd., is rigging at three development sites in the southeastern corner of Saskatchewan as a follow-up to its Mission Canyon light-gravity oil strike in the Alida district.

The company's first extension in the area was abandoned as a dry hole in the Nisku member of the Devonian formation at a depth of 4,732 ft. The well, Imperial-Hudson's Bay Alida 2-26-5-33, was located 1⅛ miles south-southeast of the discovery well.

Imperial has two rigs under contract in the field, one rigging at Imperial Alida 16-27M-5-33, ⅜ of a mile southwest of the discovery. The other rig is at Imperial Alida 12-35M-5-33, ½ mile north of the discovery well. Another rig is rigging up at Imperial Alida 2-35M, ½ mile east of the discovery well and 1 mile north of the abandoned Imperial - Hudson's Bay Alida 2-26 venture.

Meanwhile, Socony-Vacuum Oil Co. of Canada, Ltd., Woodley Canadian Oil Co. and Southern Production Co., Inc., are awaiting completion of Socony-Woodley-Southern Alida 34-8 venture in the field, with assurance of production from the Mission Canyon zone. The well lies in the northwest diagonal offset to the discovery. The well was drilled to a total depth of 3,677 ft. in the Mississippian.

The Alida discovery well, Imperial Alida 4-35 is located 56 miles northeast of Estevan, 8 miles southwest of Redvers, and 29 miles north of the North Dakota border. The well was bottomed in the Mission Canyon at a total depth of 3,774 ft. and rated an initial production of 151 bbl. a day of 39°-gravity crude from a 12-ft. perforated interval, 3,668-80 ft.

Four Catformers Licensed

PHILADELPHIA.—Atlantic Refining Co. has licensed four Canadian refineries to build Catformers.

British American Oil Co., Ltd., is building a 2,000-bbl. catalytic reformer at its Calgary refinery and recently contracted for a second unit, with a capacity of 13,000 bbl. per day, at Montreal. The Calgary unit will be on stream next month and the Montreal unit is scheduled for initial operation by late 1955.

Husky Oil & Refining Co., Ltd., will build the other two Catformers. One will be installed at Moose Jaw, Sask., and one at the newly acquired Fort William, Ont., refinery. Both are designed for processing 1,000 bbl. per day.

These four units, plus four others under construction, will bring the total number of Catforming units to 22.

Ethyl Plans Canadian Plant

SARNIA, Ont.—A plant for the manufacture of tetraethyl lead will be constructed by Ethyl Corp. of Canada near Corunna, Ont., on the St. Clair River.

The company has acquired a 100-acre site south of Canadian Oil Companies, Ltd., refinery. C. F. Braun & Co. is doing preliminary engineering for the plant, which will start production early in 1956. Cost of the project is estimated at $10,000,000 to $15,000,000.

MID-CONTINENT

Bills Seek More Production

OKLAHOMA CITY. — Bills have been introduced in the Oklahoma House and Senate to boost the state's oil allowable to a minimum of 25 bbl. daily per well. The present allowable averages about 20 bbl. daily per well.

The senate and house bills differ in one respect. The house bill would apply to each individual well while the senate bill would apply to leases. Under the senate bill if an operator had six wells, three capable of producing more than 25 bbl. daily and three not able to produce that much, he could produce the three larger ones until he reached his allowance of 150 bbl.

Gov. Raymond Gary, who took office early this month, is a staunch supporter of the 25-bbl. limit. He has disclosed in several speeches that he feels Oklahoma must regain its share of the domestic-crude market.

Kansas Pipeline Dropped

WICHITA. — Kansas Pipe Line Corp., Inc., has given up on its plans to build an intrastate natural-gas pipeline from southern Kansas gas fields to here.

The company, formed by Clint W. Murchison, Dallas, and associates, was unable to contract for enough of the 150 billion cu. ft. that it needed. Curtis W. Cannon, president of the firm, said it was organized to furnish gas to Wichita that would be free of Federal Power Commission control.

Industry Briefs

WASHINGTON.—The next sale of federal oil and gas leases on the outer Continental Shelf is more likely to be held in June than in March, an Interior Department official said last week. No definite plans have been made for the next sale, but a call for nominations is not expected to be sent out for some weeks.

LOS ANGELES.—The Los Angeles Air Pollution Control District has granted Richfield Oil Corp. a permit to operate the 35,000-bbl. fluid-catalytic cracker at the company's Watson refinery. A permit was withheld in December, pending further tests of anti-smog controls.

SANTA FE, N. M.—New Mexico Oil and Gas Conservation Commission hiked the daily allowable for the state in February by 4,911 bbl. The January rate was 252,771 bbl. daily, while the February allowable will be 257,682 bbl. The top per-well unit remains the same at 41 bbl. per day. Breakdown of the February figure shows 244,352 bbl. for southeastern New Mexico and 3,330 bbl. daily for the northwestern part of the state. The remaining 10,000 bbl. is a supplemental allowance for new wells.

AUSTIN.—Shell Oil Co. and Shell Chemical Co. have won their fight to prevent annexation of their plant by Deer Park, Tex. The Texas Supreme Court ruled in a split decision that the plant site cannot be annexed because there are no voters on the property. The decision leaves Shell free to remain outside the city as long as the company does not permit a voter to live on the plant site. It may develop that the plant is hemmed in on all four sides by the growing city. The ruling is a reversal of an earlier one favoring the city. Deer Park is expected to file for a rehearing.

REGINA.—Mid-Saskatchewan Pipe Lines, Ltd., a crude-gathering subsidiary of Royalite Oil Co., Ltd., has completed a 30-mile, 6 and 8-in. line from Smiley field in Saskatchewan to Interprovincial Pipe Line Co.'s Kerrobert station. The initial throughput of the line is 3,200 bbl.

WASHINGTON. — The Cabinet Committee on Energy Supplies and Resources Policy has agreed on the major points of the report it is to submit to the White House. It is now expected that the report will be sent to the President at the end of the month or early in February.

Oil's Budget Share

President asks for $31 million for oil, gas activities, says federal taxes on oil, products will be $1 billion

WASHINGTON. — President Eisenhower estimated last week that government supervision of the oil and gas industry in the fiscal year 1956 will cost $31 million, but federal taxes on oil and products alone will amount to more than $1 billion.

Federal revenues are being sweetened for the first time by the oil resources of the Continental Shelf. The President pointed out in his budget message to Congress that $147,000,000 already has been secured from bonuses on leases. He estimated at least $100,000,000 will pour into federal coffers during 1956 from leasing activities.

In addition to the $31 million set up in the President's budget, another $30 million is listed for expansion of the tanker fleet. Other smaller items related to the industry are scattered through the 1,343-page budget.

Tankers . . . The biggest single item of interest to the industry is the $22,400,000 asked for the trade-in-and-build tanker program started last year. This would add 20 tankers to the reserve fleet. Another $21,200,000 would build three "prototype" vessels, one of them a tanker, which could be used in case of war. They are part of a $102,800,000 program of the Maritime Commission for expansion of our merchant marine.

Interior . . . The $31 million for oil and gas activities of the Interior Department is a slight increase over this year's funds. No changes are made, however, in the appropriations of $140,000 for enforcement of the Connally Hot Oil Act or $250,000 for operation of the Oil and Gas Division.

A $630,100 increase in funds will help the Bureau of Land Management catch up on its backlog of lease applications. It will be given $2,920,000 for leasing work. The Bureau had 58,062 cases pending at the end of fiscal 1954 and with the added funds, expects to reduce this to 32,000 by June 30.

The Geological Survey will have the same budget as this year. It includes $11,320,000 for topographic surveys and mapping, $5,430,000 for geologic and mineral surveys and mapping, and $1,300,000 for supervision of oil and gas leases.

The Bureau of Mines research program for oil and natural gas carries the same price tag as this year, $1,250,000, but funds for synthetic liquid fuels research were cut from this year's $4,013,840 to $3,306,840.

The budget report lists six current oil and gas programs for the bureau. They are:

. . . **Engineering research** on development and production and technologic research on secondary recovery methods.

. . . **Transportation** and storage problem studies.

. . . **A study** of the chemistry and refining of oil and gas.

. . . **Fundamental research** on the thermodynamic properties of hydrocarbons.

. . . **Statistic and economic** studies of oil and natural gas.

. . . **Maintenance** of research facilities.

The bureau's nearly self-supporting helium program will get $90,000. On completion of the $6 million plant approved by the last Congress, it expects to turn in a profit of nearly $500,000 in 1956.

FPC . . . Congressmen are again asked for money to carry out the regulation of natural-gas producers in line with the Supreme Court decision in the Phillips case. The same request was ignored by Congress in the last session. The new budget lists $2,099,050 for regulation and surveys of the gas industry. A supplemental request for the same purpose will be made later.

The commission says the Supreme Court decision will boost annual rate filings from only about 850 to more than 20,000. In addition to an increase, certificate applications will jump from 200 to 500.

The Federal Trade Commission will broaden its drive against monopoly with an increase in funds from $1,584,450 to $1,712,750. It will also expand its economic and financial reporting with an increase from $249,000 to $377,700 for that work.

The antitrust division of the Justice Department, however, will have to get along with the same appropriation as for this year—$3,100,000.

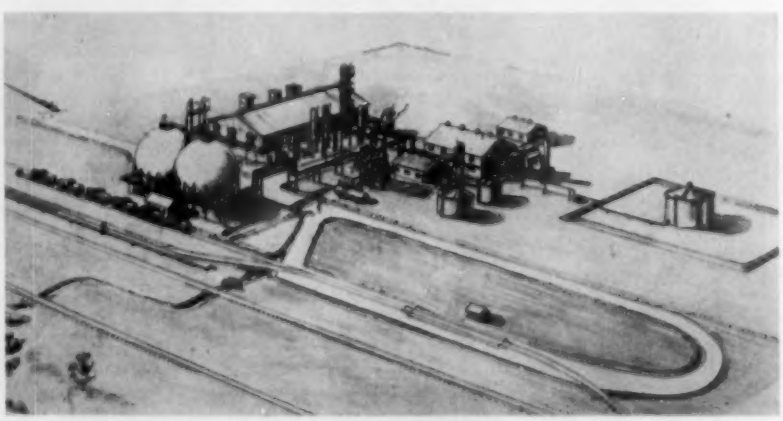
Tanker Problems to Be Aired

WASHINGTON. — The Maritime Commission will find out next week whether the coastwise tanker operators have any problems.

Administrator Louis S. Rothschild is calling a conference of tanker operators February 1, to follow a meeting January 25 with operators of dry-cargo vessels.

The February 1 meeting is designated to get the general picture of tanker operations. The big problem appears to be potential replacement of vessels in an emergency.

Any special problems developed at the two meetings will be explored at later conferences, Rothschild said.



Anhydrous Ammonia Plant Planned in Maine

Northern Chemical Industries, Inc., has awarded the prime contract for its $9,000,000 anhydrous-ammonia plant at Searsport, Me., to the Girdler Co. The project includes a 125-ton per day synthetic ammonia plant, a 60-ton per day nitric-acid plant, a nitrogen-solutions plant, and auxiliary units for producing steam, electric power, and other utilities. The Searsport plant will be the first ammonia works employing Texaco Development Corp.'s partial combustion process for deriving hydrogen from Bunker C fuel oil.

Import Council Called

I.P.A.A. sponsors Washington parley on imports quota; Dulles says it is matter for "serious consideration"

WASHINGTON.—Domestic producers from all parts of the country will meet here January 26 to plan a campaign for a quota on oil imports.

The conference was called by W. M. Vaughey, president of the Independent Petroleum Association of America, after a meeting of the I.P.A.A. and five Texas producer organizations at Fort Worth last month. All state and local producer organizations have been invited to send representatives to the Washington talks.

The drive for a legislative limitation on imports is expected to be headed again by Rep. Richard M. Simpson of Pennsylvania. Simpson led the fight for a quota last year. He already has discussed the matter with producers who will testify this week before the House ways and means committee on extension of the Reciprocal Trade Act.

Russell B. Brown, general counsel of the I.P.A.A., stressed the meeting's importance in a report to members last week. "It is extremely important that domestic oil producer organizations from all over the country be represented . . . so that the industry will have the benefit of their best suggestions."

Dulles position . . . At the opening of trade act hearings last wek, Secretary of State John Foster Dulles said Venezuela, with no appreciable domestic industry, must export oil so it can buy needed manufactured goods. But, he added, "it is the administration's intention to exercise powers contemplated by the bill in such a manner that the legitimate concerns of United States business will be fully taken into account."

"Of course," Dulles said, "competition from imports or from any other source always effects evolutionary changes in the economy. However, the bill is drafted so as to cushion our economy against undue shock by reason of competitive imports."

Dulles referred to the peril-point and escape procedures. Domestic producers, however, take the position that these procedures have never been used by the Government to restrain oil imports.

The secretary claimed the principal causes for adjustments of the economy "are not imports, but free trade as between the several states, the revolutionary developments of technical knowledge, and our antitrust policies."

Coal joins issue . . . The oil import issue came to the fore in the first session. Asked for his views on quotas for residual imports, Dulles told Rep. Hale Boggs of Louisiana it was a matter for "serious consideration" but refused to express a definite opinion without more information about the situation.

Dulles' statement was immediately picked up by Tom Pickett, executive vice president of the National Coal Association. Residual imports is a question that deserves not only serious consideration but quick action by Congress, Pickett said in a letter to the secretary.

"We think it would be an act of distinguished statesmanship for your department to bring to the importing oil companies and the countries from which flow this unreasonable flood of oil an understanding that America's defense posture now requires a reduction of these imports."

No Price Preference

Refinery dispersal scheme spurned by defense official

WASHINGTON.—The Defense Department will not pay higher-than-market prices for petroleum products to support refineries outside of the congested industrial areas.

The Office of Defense Mobilization wants to disperse vital production facilities. But Robert C. Lamphier, Jr., Deputy Assistant Secretary of Defense, says the military won't spend its money foolishly just to stimulate dispersal of petroleum refineries.

It has been suggested the Government use its purchasing power to sustain capacity outside target areas to safeguard supply sources and to alleviate the distressed condition of many small refiners.

This was laid before the Cabinet Committee on Energy Supplies and Resources Policy and the Defense Department by A. W. Scott, president of the National Petroleum Association. The cabinet committee referred the proposal to the Oil and Gas Division.

Lamphier says the department has authority to buy at higher prices than the competitive market to maintain an adequately dispersed mobilization base. That authority, however, is being limited to a select list—on which oil products do not appear.

Lamphier takes the position that Scott's proposal would be unfair. It would be necessary to give preference in cash and contracts to refiners in outlying areas and exclude both large and small refiners in concentrated areas, he said. It also would be direct subsidization of only part of the petroleum industry and would raise the problem of just how far to go when two or more refiners meet dispersal requirements.

Lamphier pointed out that small refiners normally cannot supply such products as aviation gasoline of the top grades, alkylate or large volumes of Navy Special fuel oil or jet fuel. But on other products, he said, the Armed Services Petroleum Purchasing Agency has consistently given small business a fair chance to compete for military purchases.

Fifty per cent of ASPPA's contracts went to small business in the last fiscal year. This is 16 per cent of the agency's total dollar purchases, Lamphier said.

No More Alkylate Reports

WASHINGTON.—Aviation gasoline producers will not have to report new construction to the Oil and Gas Division in the future.

Interior Secretary Douglas McKay says refiners may discontinue the reports required in the past when new facilities for alkylate or aviation gasoline were built. Refiners have been required to report when they planned construction which would increase alkylate or avgas production by 100 bbl. or more daily, and to submit month progress reports.

The increased supply of aviation gasoline has made these reports needless McKay said. The OGD will get the information from the semiannual progress reports filed with the Office of Defense Mobilization by companies given accelerated tax amortization for new facilities.

Depletion Study Incomplete

WASHINGTON.—Treasury recommendations on the oil and gas depletion allowance will not go to Congress this year—unless Congress demands them.

The department has not yet completed the study which President Eisenhower ordered a year ago, Secretary George M. Humphrey told a news conference last week. Until the study is completed treasury officials will not take a stand, he said.

Humphrey said the depletion study is one of the most difficult the department has made, involving "a great many problems."

Rough Range Hopes Fade

Search to move south from discovery area after fifth offset abandoned; drilling will resume at Cape Range

FAILURE of a fifth stepout well has curtailed efforts to develop production in the immediate vicinity of the discovery made 14 months ago on the Rough Range structure in the Exmouth Gulf area of Western Australia.

Rough Range 6 was drilled well below the 3,605-20 ft. depth at which some 500 bbl. of oil daily was tested from basal Cretaceous formations in the No. 1 well in November 1953.

The four previous unsuccessful wells were drilled at varying distances ranging up to 6,200 ft. from the discovery. They were to the southwest, northeast, south, and west of No. 1.

Despite these disappointing results, the company, West Australian Petroleum, Pty., Ltd. (WAPET), is continuing surface work and drilling elsewhere on its extensive permit areas in Western Australia.

New plans . . . Location for a new wildcat has been selected about 100 miles south of Rough Range in the salt-marsh region near Warroora Station, about 80 miles north of Carnarvon. The company is moving its light rig off Cape Range for the test.

Further plans for Rough Range call for moving the other light rig farther south on the same structure for core drilling.

The Cape Range test, which was dry in the formations found productive in Rough Range 1, has been suspended at about 8,000 ft., depth limit for the rig. Heavier equipment is to be moved in to resume drilling. Some encouraging shows were found in this well, and another test is planned higher on the structure.

The Rough Range discovery is still being deepened for stratigraphic information. The hole is below 13,000 ft. To the northeast, WAPET's Grant Range wildcat was last reported at about 5,000 ft.

WAPET, which is owned 80 per cent by Caltex and 20 per cent by the Australian company, AMPOL, has more than 100 men engaged in surface work. Four gravity meter parties and four geological parties are in the field, and further seismograph work is planned this year.

Permits renewed . . . The Western Australian Government announced in Perth that it has renewed the company's exploratory licenses for another 12 months except for two areas in the Joseph Bonaparte basin and the northern part of the Fitzroy basin which the company voluntarily relinquished. WAPET's original permit areas covered 320,000 sq. miles and took in nearly all the sedimentary area of the state. The acreage retained under permit for another year amounts to 225,000 sq. miles.

The Western Australian Government is subdividing the two relinquished areas into nine exploration sections and has invited interested companies to apply for permits. Prospective applicants include Frome-Broken Hill, Pty., Ltd., (Stanvac-British Petroleum, and local Australian interests) and Royal Dutch-Shell. Shell has a 75 per cent interest in a group formed with Australian mining companies. The organization has announced it will explore in Western Australia if suitable areas can be obtained.

In eastern Australia, three companies, Woodside Lakes Entrance Oil Co., Frome Lakes, Pty., Ltd., and Frome Austral Pty., Ltd., plan to drill in the Woodside area east of Melbourne in Victoria. The Woodside company has announced it will use equipment capable of drilling to 10,000 ft.

In Australia's Northern Territory, exploration work has been delayed because regulations for the issuance of permits have not been made official in the government gazette. The territorial legislative council early in 1954 passed legislation regulating exploratory work. The ordinance was amended in November, but it still must appear in the gazette before permits can be issued.

Several companies applied for permits a year ago. One company, with equipment and staff ready, has pointed out that a delay beyond the early part of this year would prevent it from operating in the next dry season and probably would mean another year's holdup. The companies are mainly interested in the area bordered by the Victoria River on the east and the Joseph Bonaparte Gulf on the north and west.

Far East Picture Brightens with . . .

. . . Stanvac Plans for Indonesia

STANDARD-VACUUM OIL CO. has big plans for Indonesia—plans that will see $70,000,000 to $80,000,000 spent in the next four years.

The company has mapped the big capital-investment program in Indonesia in the wake of a new agreement with the government on the financial phases of its operations. The program will include:

. . . Extensive modernization of the Sungei Gerong refinery near Palembang in South Sumatra.

. . . A 90-mile pipeline giving an outlet to the new Lirik field in Central Sumatra.

. . . Further development drilling in Lirik field.

. . . Construction of a modern office building at Palembang and various facilities for employes.

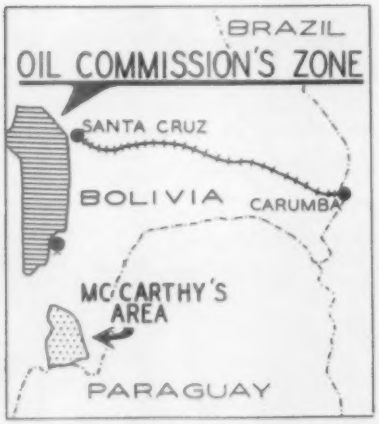
The agreement with the government was reached after many months of negotiations. The successful conclusion of the negotiations and the plans for the expenditures were announced in Djakarta by G. L. McCoy, head of the Stanvac operating units in Indonesia, and confirmed at the company's headquarters in New York.

The Lirik pipeline ranks as one of the company's top projects. It is due to be completed across the difficult country of Central Sumatra in 1957 or 1958. Lirik crude will then become commercially available for the first time.

The net effect of the agreement will be to place the company's Indonesian operations on a more nearly competitive basis with the Middle East. In recent years products from the low-cost Persian Gulf area have taken an increasing share of Far East markets.

In announcing the program, Stanvac said it is hopeful that Indonesia will revise its mining laws and open new areas to exploration. Stanvac and the two other operators in Indonesia, Shell and Caltex, have had to confine their activities to pre-war development lease areas.

Stanvac has been a marketer in what is now Indonesia since 1894. Its producing activity dates from 1914. It regularly employs about 13,000 persons in Indonesia.



Zone Gets New Look

Completion of railroad to boost search in Bolivia

PLANS for joint Bolivian-Brazilian exploration and development in eastern Bolivia have received new impetus with the completion of the Santa Cruz-Corumba railroad.

The 423-mile railroad giving landlocked Bolivia a transportation link to the east was financed by Brazil as a part of the oil exploration project. A large area has been reserved in eastern Bolivia for operations by the Bolivian-Brazilian joint oil commission. The commission's zone is north of the area being explored by Houston's Glenn McCarthy.

The presidents of the two countries, Victor Paz Estenssoro of Bolivia and Joao Cafe Filho of Brazil, issued a statement promising a speedy start on exploration work when they met at Santa Cruz for inauguration of the railroad line.

The joint oil program was provided in a treaty signed by the two countries in 1938. Brazil has first claim on any production up to a minimum quota under which it stands to recover its share of the expenses. The zone is largely untested. Each country is to advance $1,000,000 for the initial operations.

Why deal was made . . . Brazil's domestic production meets only about 2 per cent of the country's approximately 150,000 bbl. daily consumption, and oil-import requirements drain the Brazilian economy of about $265,000,000 annually.

The zone for the joint Bolivian-Brazilian program lies north and west from Camiri field. Camiri supplies most of Bolivia's production, which as a result of successful exploration and development during the last year has more than tripled to around 5,500 bbl. daily, leaving a surplus for export.

Swiss Price War Grows

Big retail firm contracts for crude from Neutral Zone to assure supply of products for cut-rate operations

GASOLINE prices in Switzerland have fallen another notch as a result of the price war which was touched off last summer when the Swiss Migros company entered the market.

The dealers' association (Autogewerbeverband) has set a new price range of 50-53 centimes per liter (44-47 cents a gallon) as compared to 53-55 centimes charged previously. About half the price (26 centimes per liter) is tax.

At the stations which it has opened in Zurich, Basle, and Geneva, the Migros organization has been selling motor fuel at 49 centimes per liter (43 cents a gallon). The established dealers have announced their intention of opening stations alongside those of Migros and dropping their prices to 47 centimes per liter.

Background . . . Migros is a large Swiss merchandising cooperative dealing in food and other commodities. It grew out of a company founded to lower prices by using American distribution methods and eliminating wholesale profits. Its head is Gottlieb Duttweiler, a member of the lower house of the Swiss Parliament, the National Council.

Last March, Migros organized the associated Migrol company to engage in the oil trade. President of Migrol is Jean Arnet, who came to the attention of the international petroleum industry in 1952 when his Bubenberg company chartered the tanker Rose Mary and lifted a cargo of crude oil from Iran. A court at Aden later gave possession of the cargo to Anglo-Iranian Oil Co., Ltd.

THESE FACILITIES are at Garrone Oil Co.'s Genoa, Italy, refinery which will process part of the Neutral Zone crude bought by the Migrol organization for its Swiss market. Capacity of the Garrone refinery is being expanded. Markets outside Italy are destined to get 60 per cent of the plant's output.

Crude supply . . . To assure continuity of supply for its oil-marketing business, the firm contracted to buy Neutral Zone crude oil from American Independent Oil Co. The crude is moved to Europe and refined in locally owned plants in Italy, Germany, and Belgium, and the products are shipped on into Switzerland by Migrol.

Migrol's adversary in the price war, the dealers' association, has been described as a sort of noncompulsory cartel to which most of the important gasoline marketers belong.

In a New York press conference recently, Duttweiler lashed out at what he claimed was an oil monopoly backed by major-company suppliers—Esso, Shell, Gulf, Caltex, and BP (British Petroleum Co., Ltd., formerly Anglo-Iranian). He recounted his entrance into the grocery business in 1925 and said his aim was to "normalize" gasoline prices in Switzerland.

Duttweiler said his contract with Aminoil had a 5-year term and that the first year would probably involve about 100,000 tons, or 2,000 bbl. of oil daily. About a third of the crude, he said, will be refined in the Genoa, Italy, plant of Garrone (capacity about 5,700 bbl. daily). The rest of the crude will be processed by unidentified refiners in Germany and Belgium.

Outlook . . . The Swiss Government has taken a passive position toward Migrol's cut prices since it is especially interested in low-cost gasoline for the tourist trade.

Swiss gasoline prices already are somewhat lower than those in surrounding countries where the tax on the product runs higher. The price war could easily spread to some of these countries. From a broad point of view, the Swiss situation is symptomatic of the oversupply conditions presently prevailing in European oil markets.

Actually, the Migrol has a relatively small share of the total Swiss market, which requires about 10,000 bbl. of gasoline daily. Duttweiler said he was aiming for about 1½ per cent of the market.

Search Planned in Sudan

The Government of Sudan is inviting foreign-oil companies into the country to make preliminary surveys of its petroleum prospects.

The Sudanese minister of social affairs said in Khartoum that any foreign capital is welcome, and particularly from oil companies making exploration surveys.

British Petroleum Co., Ltd., (formerly Anglo-Iranian) is expected to send a party into the country in the near future. The company's plans were revealed by the Sudanese prime minister during a recent visit to London. However, the Sudanese social minister said later that this did not constitute a concession agreement.

Sudan is a 968,000-square mile territory situated south of Egypt. It has been a British-Egyptian condominium. Whether it will be an independent nation or linked in some form with Egypt will be decided by a Constituent Assembly that probably will be elected in 1956.

The eastern side of the Sudan and a substantial part of the interior is covered by igneous-metamorphic basement rock. The country offers some sedimentary section in the upper Nile Basin and in other basin areas to the northwest.

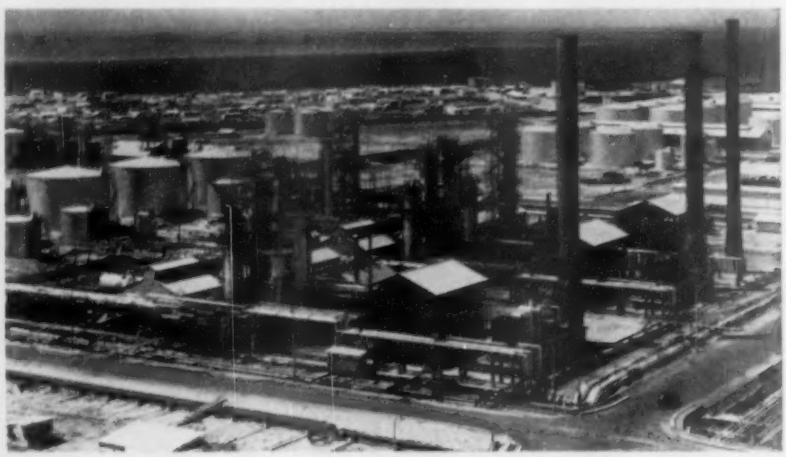
International Briefs

Permits for preliminary exploratory work in Guatemala have been issued to two United States companies, Richmond Oil Co. (Standard Oil Co. of California) and The Texas Co. Both cover areas in the northern Peten Province, considered the country's most prospective area. A recent decree authorized preliminary exploration by permits pending passage of new petroleum legislation.

Survey work has started in the southeast coastal region of Muscat by Petroleum Development (Oman) Ltd. The company holds rights over the entire sultanate of Muscat and Oman except in the province of Dhofar of about 30,000 sq. miles. Petroleum Development (Oman), associated with Iraq Petroleum Co., Ltd., relinquished this area in 1951, and the concession was subsequently taken out by a subsidiary of Cities Service Co.

West German Shell Oil Co. (Royal Dutch-Shell) has increased its capital by nearly $12,000,000—to $40,500,000—to provide funds for Rheinische Olefinwerke, a company organized by Shell and Badische Anilin und Soda Fabriken, one of the largest successor companies of the former I. G. Farben combine, for the production of petrochemicals.

The first well in an exploratory program being conducted by Shell and British Petroleum (formerly Anglo-Iranian) in British East Africa has started on Mafia Island off the Tanganyika Coast. The Mafia well is projected to a possible 12,000-ft. depth. The operating company is Shell-D'Arcy Petroleum Development Co. of Tanganyika, Ltd.



Venezuelan Refinery to Expand

PLANT construction since the end of the war has made Venezuela the largest refiner in Latin America.

Latin America's largest refinery is that of Cia. Shell de Venezuela at Cardon on the Paraguana Peninsula in northwest Venezuela. The refinery processes about 165,000 bbl. daily. Actual crude capacity is 145,000 bbl. daily, but additional crude is charged to the thermal-cracking units. Shell recently announced plans to erect a large catalytic-cracking unit of approximately 35,000 bbl. daily at Cardon.

Crude for the Shell refinery as well as the nearby Amuay Bay refinery of Creole Petroleum Corp. is delivered through large-diameter pipelines from fields in the Lake Maracaibo basin. The basin accounts for approximately two-thirds of Venezuela's production of nearly 2,000,000 bbl. daily.

Before the postwar expansion, the basin's crude was shipped to Curacao and Aruba in the Netherlands West Indies. Substantial shipments of crude as well as products are now made from terminals on Paraguana Peninsula. Cardon produces a full line of major products and a $21,000,000 lubricating-oil plant provides about 2,000 bbl. daily of lubricants, meeting Venezuela's domestic requirements.

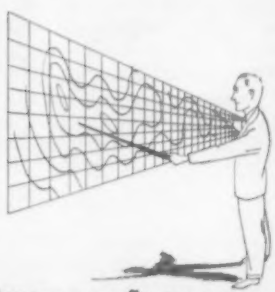
The Road Ahead . . . As Oil Men See It

Presenting the third section of "What's Ahead in 1955" comments by the Journal's all-divisional Editorial Advisory Board. These contributions by oil and gas industry leaders are concise and significant appraisals of coming events and developments. Final installment will appear in next week's issue.

Exploration

Explore with "broad view"

"There is another phase of exploration which is called to mind almost every day by our presently accepted 'punch a hole and see' method that shouts loudly that our geological efforts have a too narrow scope of planning. To some extent there has been a broad view of looking over areas in a very preliminary manner to determine whether or not they have hydrocarbons for reservoir possibilities, but these have been too cursory and do not take the time to study the over-all geological structural and lithological situation over a broad area. The accepted practice is to do a skimpy seismograph job, possibly some magnetic work, drill three or four core holes and walk off and leave it. This is borne out by the fact that the increased price of gas in the eastern part of the United States has stimulated the 'punch-hole' activity in the Appalachians recently which has resulted in rather important gas discoveries (Leidy and Benezatte fields in Pennsylvania). Like a snowball, the interest is increasing rapidly and much activity in this direction is going on even to the point of a glimmer coming in certain geologists' eyes that if there was oil on the western flank of the Appalachians, that there is a good possibility that it would be on the east side of the Appalachians. It has taken about a hundred years to come to that conclusion."



"BROAD VIEW" EXPLORATION

Over-capacity . . . unbelievable

"To those of us who have been engaged in wildcatting developments for many years, the present over-capacity of production seems almost unbelievable. Each year with the difficulty and cost of finding new reserves of both oil and gas, it is natural to look ahead for the next few years and figure that we will use up the surplus daily producing capacity due to two reasons, first, increased demand, and second, the lack of first class prospects and the increased cost of all exploratory work. A little over a year later when the results of that year are tabulated, **we find an increase of total reserves of oil and gas and also daily capacity production.** The reason for this is that large amounts of outside capital have gone into the exploration end of the business, due to the tax advantage we enjoy and to the glamor of the business."

Prices

An independent refiner defines his problem

"Much is heard today about imports of foreign oil and their effect on our domestic industry, about the problems of excess refining capacity, about the high level of product inventories, about the so-called 'refiner's margin' or the spread between crude oil costs and product prices. The depletion allowance, gasoline price wars, the rash of mergers among small refiners, and a host of other related topics are also under constant discussion.

"From my vantage point as an independent refiner these problems, however diverse in their implication they may seem to the outsider, are actually one problem. This might be called 'the role of competition in the oil industry' or 'the place of the independent refiner in the industry.' The problem is created by a chain of circumstances which might be stated as follows:

"An artificially high crude-oil market throws the bulk of profits today into the producing branch of the industry at the expense of the refining branch and thereupon enables integrated oil companies to enjoy to an unreasonable extent the benefits of the depletion allowance. This high crude market also has the effect of greatly stimulating imports of foreign oil. The domestic refining capacity which, we all realize, now far exceeds our peace-time requirements, is thus encouraged to operate on an abnormally plentiful supply of crude and, consequently, to produce a glut of refined products. The inevitable result of the above is generally depressed product price structures and near chaotic market conditions.

"As the margin narrows between crude oil market levels and product prices, an increased number of independent, non-integrated refiners will disappear either by merger, by sale or by retirement from the industry. This last effect we will all be sure is one thing that no federal government can tolerate. To permit a continuance of the trend which has developed during the past year is surely to invite government intervention in our industry.

"If action is not taken in 1955, the chances are that we may find ourselves with a remedy in the form of a government-imposed restriction on imports, or a reduction in the statutory depletion allowance, or a guaranteed margin for service station operators, or a divorcement of the various branches of the industry, or worse."

Good year . . . if

"If the state regulatory bodies, including the Oklahoma Corporation Commission, exercise reasonable judgment regarding increases in state allowables, and not force a lowering of the price of oil, the forthcoming year should be excellent for all branches of the oil business."

"Chief evil . . . matter of communications"

Personnel

Reward foremen; boost young men

"Also to improve personnel, I think some system, and it will be different in each company case, of incentive reward being given to an outstanding personnel at the foremen and superintendents level at least once a year that will put your line people in competition with each other for recognition and bring to light your likely candidates for management.

"Management status should be given people at the age of 30-35 rather than waiting until 55-60 which has so often been the rule in eastern United States. Waiting until 55-60 to give an employe real managerial responsibility is only kidding the stockholders because in many instances a man has begun to think of retirement and if things are going along fairly level, does not want to do anything to make him more work or the possibility of it failing before he gets his pension. The young man will strive hard for accomplishment and justification of the confidence placed in him. This is not a new thought but there are numerous examples of how it has worked."

Better communications are needed

"The order of the day generally is decentralization which automatically demands an improvement in the personnel from the standpoint of capability, for increased responsibility, and the development of ingenuity and resourcefulness. If employes are not contented, their lower productivity will reflect it. One of the chief evils is the matter of communications particularly where unions are involved. There should be a better system of keeping the line foreman advised of the results of any negotiations or policy changes ahead of the union steward telling the men. If the latter situation prevails, the men soon lose confidence in the foreman, thereby reducing his effectiveness. One way this could be done is have a member of the Employee Relations Department sit in as an advisor to the management who is conducting the negotiations, and this man leave the meeting while the final drafts are being drawn up for initialing by both the union and the management. He could at once call three or five stratigically located men who in turn, could as quickly as possible call five men, so that in a matter of 30 minutes the information would be in the foreman's hands and he can promptly explain to the men and thereby retain their confidence and his effectiveness as a foreman."

Pipeline

Prognostications on gas pipelines

"The Federal Power Commission will alter and mitigate its Order No. 174 in 1955, through necessity rather than desire. This action will arise from the physical inability to implement completely the ruling of the Supreme Court. Casinghead-gas connections and contracts will be exempted, as will distillate wells entering a unitized gathering system. But, the commission will not give up jurisdiction over all gas sales to interstate pipelines. Companies now holding temporary injunctions will be forced to follow the commission rulings.

"Very few, if any, new interstate pipelines to transport gas will be built after the Pacific Northwest, but the commission will grant, perhaps reluctantly, certain enlargements, loops, and extensions to existing facilities.

"The proposed gas pipeline to Florida probably will not receive the sanction of the commission. The trans-Canadian pipeline will be started and will be operated in conjunction with other Canadian lines and American lines already installed or previously authorized. This will be accomplished in spite of opposition from many eastern American gas companies.

"The surge in development of underground storage for both natural gas and liquefied petroleum gas, will subside, at least to such an extent that both industries will be stabilized so far as summer markets and winter demands are concerned."

Natural Gas

Gas prices cheaper under FPC?

"I do not think that free competition (instead of FPC) would cause any appreciable rise in the price of gas in the next 10 years, that is, over the top price existing on the Gulf Coast. In the industrial East where the wellhead price of gas has been 25 cents for the past 10 years, it has gone up to 27 cents in only a few instances. The transportation cost between the Southwest and the industrial consuming area in the Middle West and Northeast will tend to hold the price back down to somewhere near 20 cents at the well. It is true that in some areas where the price, due to old contracts is exceptionally lower, will increase toward what I arbitrarily think to be between 15 and 20 cents. On the basis of 1½ cents per M.c.f. per one hundred miles, that would mean somewhere around 35 cents gate rate. At this point with the increasing efficiency of the coal industry together with the increasing availability of fuel oil, these latter two can, in many instances, replace gas for large industrial uses. When this comes about, instead of having a 90 per cent load factor throughout the year, it becomes a 40 per cent load factor in the summer and a 100 per cent load factor in the winter, which automatically increases the price to the ultimate domestic consumer, even to almost doubling it, thereby making way for electricity, oil, and smokeless coal in big apartment installations to replace gas as the heating media.

"This is a long way of saying that **if the law of supply and demand is permitted to work unobstructed by government interference that fuel prices will automatically seek their competitive level and in the end will benefit the overall population.**"

"Water-flood oil . . . increasing in importance"

What kind of natural gas "bill" would work?

"What is needed, it seems to me, is a bill somewhere between the Moore-Rizley type (would have freed all producers of FPC regulation) and the Kerr type (would have taken care only of gas produced by operators who have no long line affiliation).

"This needed bill would free the independent producer from FPC control up to the tailgate of the processing plant, but retain control of the long lines gas by the FPC, not on a utility basis, however, but on a basis of fair field prices as established by the independents in arm's length competition and as determined by the FPC. What such a bill does is restore the status quo that existed just prior to the Supreme Court decision in the Phillips case. The long lines, I am sure, will ask nothing more than this type of bill. They ought not to have less.

"What this type of bill would do is to write in the law the decision of the FPC in the Panhandle Eastern case. That was a four-to-one decision and was arrived at after a great deal of study by the commission and long experience in regulating the gas of natural-gas companies on a utility basis.

"Passing this legislation is going to be difficult at best. I repeat that you cannot render the industry a greater service than to solidify its thinking on the type of bill, and I hope your conclusions on the subject will coincide with mine."

Drilling

Slim-hole drilling . . . what about prices?

"We find this subject to be highly discussed by the engineering division of most oil companies; however, we also find when the actual rigs are put into use, the equipment itself on that shallow and small-hole work is still secondary to the price. Therefore, it is not considered as a major item by most companies.

"There are yet today very few lightweight, highly-portable drilling rigs of new and modern design in the oil fields, the reason being the high cost of any equipment today is still so great that you can do the same work with the older, smaller rigs that have been used for the past 15 years. Most companies say that they definitely prefer the newer type, lightweight, highly-portable drilling rig, yet the increased cost of any materials is so much greater than the savings the small efficient rig might make over the older style rigs, that the companies still take the older rigs because the price per foot is still the cheaper.

"The above are naturally 'contract jobs' which I am referring to. Most new company rigs bought for this purpose are specially designed and are bought to fit the new modern type of drilling program."

Drilling contractor sees mechanical gains

"In 1955, the trend in technical advances will continue. Proper application of available power through the best use of hydraulics, not only in the application of jet bits but in selection of hole and pipe size, will be given more and more attention. Too little attention has been paid to this, but in those instances where advantage has been taken, rates of penetration have been increased.

"The work that has been done on drill collar application and selection and stabilizer selection by the A.P.I. study group, and especially Arthur Lubinski and Henry Woods, is beginning to bear fruit in crooked-hole territory.

"More oil and gas companies are recognizing the fallacy of an 'X' degree deviation clause in their contracts and are beginning to be more conscious of the savings possible in drilling costs when a rate of change type deviation clause is substituted. A tremendous amount of money is expended each year by the industry in holding to a strict 3° or 4° vertical type of contract in situations where there is no real necessity and in situations where actually the strict adherence to this principle results in doglegged holes with consequent later production problems.

"Air and gas drilling present a lot of problems but under certain circumstances can produce great savings. Continued experience and experiments will undoubtedly cause more of this to be used in the future."

The "deep drilling" price situation

"With reference to the development of 12,000-ft. and deeper reservoirs throughout the country today, there has been a great increase in that type of work, but as in the earlier picture, the companies are still bound by company policy to accept the lowest price available, and you therefore find many smaller rigs being extended to greater depth drilling because they are being bid at lower prices."

Production

Many independents can produce cheaper

"One of the chief troubles of the major companies is over-organization, so that in many instances small pools are located, which if carefully studied at the time of finding, would point immediately to the fact that they should be farmed out to independent producers who could for the most part operate much cheaper and thereby recover more oil from these pools. Exploration is increasingly becoming a function of the larger and more financially able organizations, but in numerous cases, the development and operation should be turned over to independent operators for the overall benefit of the nation in recovering the maximum amount of hydrocarbons."

Secondary recovery expanding

"Of growing importance during 1955 will be the increasing need of water-flood oil to assume some portions of the proration burden. Water-flood oil is increasing in importance and magnitude statistically all the time. In a period when the tanks are full the special advantages of water-flood oil of unrestricted production must be critically examined. Probably the key to this question . . . is whether ultimate recovery of oil by water-flooding is affected by a curtailment in either rate of production or injection of water. If this question could be answered clearly and convincingly, one way or the other by the technologists, the regulatory bodies would know how to act."

Secondary recovery "stretchout"

"In the past the policy has been to develop secondary recovery projects in a period of 5 or 6 years. Due to the limited market for oil it may be that engineering departments will have to plan programs which will produce the secondary oil for a period of 15 or 20 years so as not to be a burden on the market. In view of this, careful study of markets and proration problems will have to be made by respective states."

Why Drill With Aerated Mud?

ROCKS buried in the earth are subjected to triaxial compressive stresses due to the weight of the overburden and the lateral expansive forces due to temperature or other tectonic factors.[1 2] In drilling with mud, these natural compressive stresses are balanced somewhat by the pressure head exerted by the mud column.

If the hydrostatic pressure against the surface below the drilling bit is lowered by reducing the density of the mud column, the downward vertical component of stress in the formation is reduced. This relief of stress in one direction assists the drilling process and has the effect of making the rock easier to penetrate. The increase in drilling rate with decrease in hydrostatic pressure is greatest in shales and the softer rocks and diminishes in harder formations. In laboratory tests, shale was drilled 10 times as fast at atmospheric pressure as at 2,500 psi. while basalt responded to a 43 per cent increase under the same conditions.[3] (See Fig. 1).

The pressure exerted on a formation while drilling may be reduced to a minimum by using air or gas as a circulating fluid. However, the pressure below the bit may also be reduced by employing a combination of air and mud, with air-mud ratio having a controlling influence on the reduction in pressure. Aerated-mud drilling would have the following advantages over air or gas drilling:

1. Low-pressure water zones can be penetrated. With air, presence of moisture balls up the cuttings, causing bridging and locking of the drill pipe in the hole.

2. It is safer. Quick weight build-up by shutting off the air and circulating with mud can be obtained when needed.

3. It is also safer from the standpoint of obtaining a better seal with the surface drilling head. The entrained mud makes a gastight seal much easier to obtain.

4. Hole deviation should be less than with air, owing to the sleeve-bearing effect of the mud phase between the drill collars and the walls of the hole.

5. Cuttings, for sample purposes, are larger and easier to catch since they remain with the liquid phase.

6. The hole, being continually subjected and conditioned to mud, will stand up better. With air or gas drilling sloughing often occurs when the hole is filled with mud. Sloughing also is likely with air drilling when small quantities of water are encountered.

Mud surge out of the flow line while drilling with aerated mud. Proper baffling in the end of the flow line controlled these surges in later tests.

A promising new tool

Phillips Tests Air-Mud Drilling

• *To reduce lost circulation*
• *To increase bit penetration and footage*

by Roy A. Bobo, George S. Ormsby, and R. S. Hoch

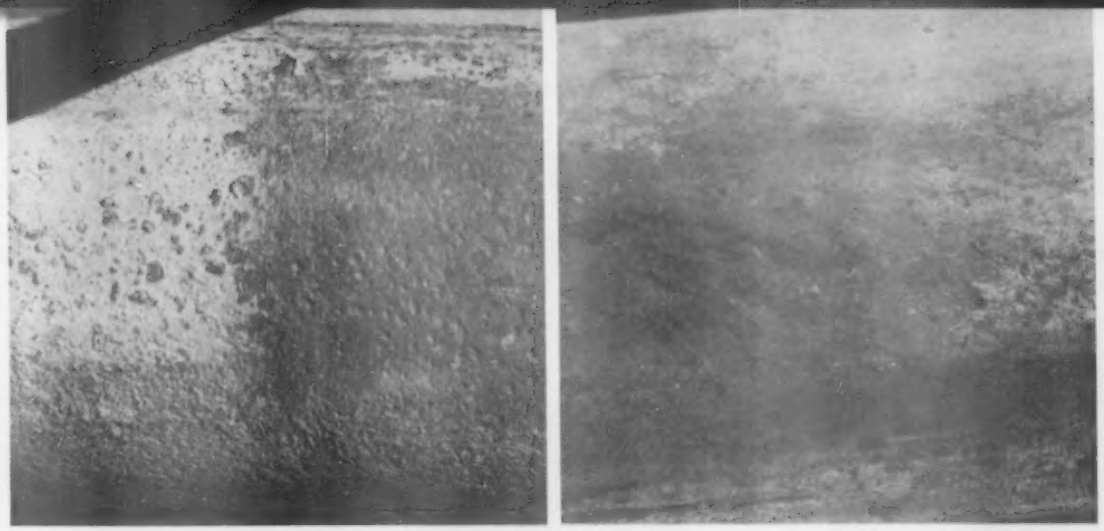
Part 1

PRESENTED here is the experience of Phillips Petroleum Co. in its first three trials of drilling with the air-mud mixture produced by injecting compressed air into the standpipe. Not only can this method help alleviate loss of circulation, but it also holds promise of increasing drilling rates appreciably.

Corrosion of the drill pipe, a problem on the first test, responded to chemical control and is not considered an obstacle to economic success.

Next week's Journal will contain the remainder of this report and will describe the equipment used, techniques necessary, and fundamental theory.

As a means of exploring a promising new field, Phillips Petroleum Co. undertook field investigation in May 1953 of drilling with a combination of



How Corrosion Was Controlled

Upper left: A portion of 4-in. drill pipe after 48 hours of air injection on 1 Odom "C" with no inhibition. Pits occurred under scale tubercules like those in area not wire brushed. Upper right: 5-in. drill pipe from 1 Odom "D" after drilling 11-in. hole to 7,682 ft. with aerated mud using chromate inhibitor. Inhibition with chromate was less than 100 per cent, but it was sufficient to prevent significant damage. Right: Drill-pipe stands showing white coating from saturated lime water. Saturated lime water proved to be effective in inhibiting corrosion, easy to control, and cheap to maintain.

air and mud as a remedy for loss of circulation.[4] In this method, a portable compressor discharged air at 125 psi. between two mud pumps that were connected in series, with the second of the two pumps handling both air and mud. The two-pump method of introducing air into the drill pipe has good potentialities but is currently limited by the unusually large clearance volume inherent in conventional mud pump cylinders.

At the same time that experimental efforts were being made for assisting loss of circulation, plans were under way to utilize aerated mud as a means of increasing the penetration rate and bit footage, with the ultimate purpose of overcoming some of the drawbacks inherent in air and gas drilling. Though loss of circulation is one of the costliest items in certain areas, the key to reduction in over-all drilling costs lies in increasing the footage per operating day.

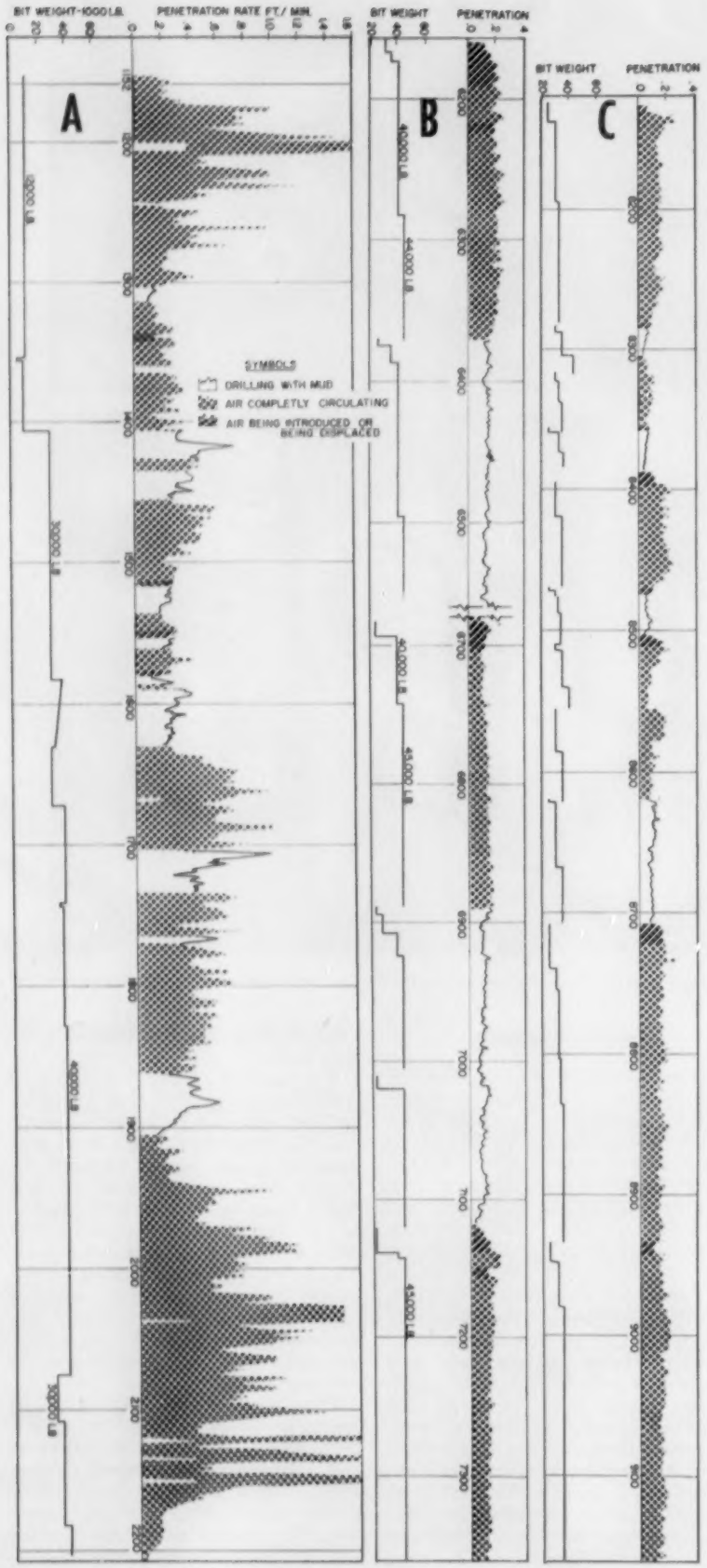
Standpipe Aeration

First test—1 Odom "C" . . . The first mud aeration by injecting air directly into the standpipe was conducted on Trinity Drilling Co. rig No. 12, drilling the Phillips 1 Odom "C" in Puckett Ranch field, 40 miles south of Fort Stockton, Tex. Injection was maintained for a total of 53¾ hours from February 28 to March 3, 1954. During this time 264 ft. of hole was drilled with aerated mud starting at 7,391 ft.

Air-to-mud ratios varied from 115 to 160 cu. ft. of air (standard measurement) per barrel of mud. The mud consisted of fresh water, bentonite, quebracho, caustic soda, "antigyp," and native solids with the following range of properties during the test: weight, 9.2-9.6 lb. per gal.; Marsh funnel viscosity, 37-41 seconds; Stormer initial gel, 0-0; Stormer 10-minute gels, 0-0; pH, approximately 8 to 9. Hole size was 7⅞ in. through 8⅝ in. o.d. casing set at 5,088 ft. Only conventional bits were used.

The test was stopped at 7,923 ft. when severe corrosion was found on the drill pipe, tool joints, and drill collars. No special attempt had been made to protect against corrosion, as it had been expected that the rate would be extremely slow if it occurred at all. This test indicated that a few hours of air injection may cause severe corrosion under certain conditions. Although the service life of the string of pipe was not materially affected, it was apparent that steps to protect against corrosion would be necessary prior to further injection of air.

Plans were immediately started to inject air beginning near the surface of a hole to be drilled in the same area. Although the 1 Odom "C" test was too short to permit evaluation, it had served to delineate the major problems, to indicate techniques, and to test the surface air equipment.



Field Tests Prove Speed Of Air-Mud Drilling

Penetration curves of Phillips 1 Odom D

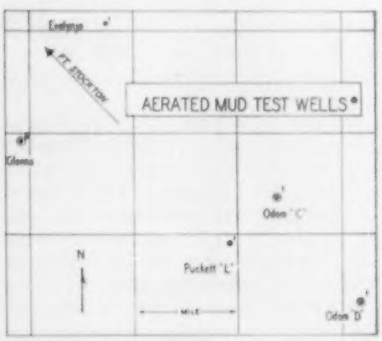
AIR injection was used from 838 to 1,152 ft. in the 8¾-in. surface rathole in order to combat complete loss of circulation in cavernous formation. Although injection of air did not establish circulation, it did decrease down time waiting for water by permitting equal or faster penetration rates with lower mud rates than normal.

After setting surface pipe at 981 ft., drilling with aerated mud continued to 2,200 ft., but was stopped frequently to check effect on penetration rate. Penetration rate on the charts is a 3-ft. average every foot to eliminate extreme fluctuations due to mechanics of rig operation. Note that air injection exaggerates softer drilling breaks, and that drilling-rate peaks are higher and usually more sustained with aerated mud. However, with bit weights used in this section, drilling-rate lows were affected negligibly by air injection.

From 4,138 to 7,862 ft., air was injected on alternate bits when possible. Average bit footage from 6,156 to 7,650 ft. was 44 per cent more with aerated mud than with mud.

Most promising results of the entire test came in the 7⅞-in. hole from 8,126 to 9,162 ft. Decreased annular area permitted cutting mud rate in half during air injection. Penetration rates were increased by 35 to 120 per cent and bit footage life by 50 to 120 per cent with air injection.

The map below shows relation of locations of wells on which aerated-mud drilling was used and comparative wells on which it was not used.



Second test—1 Odom "D" . . . Air injection commenced on the Phillips Petroleum Co. 1 Odom "D" March 10, 1954, at a depth of 838 ft. in the 8¾-in. surface rathole, drilled with company rig No. 37. The main reason for using air in the surface hole was to combat complete loss of circulation to apparently cavernous formations. Inspection of drill pipe as it is pulled from the hole indicates that these surface formations in this area exhibit no pressure head whatsoever. Although the injection of air did not establish circulation, it did decrease down-time waiting for water by permitting equal or faster penetration rates with lower mud rates than normal. Aerated mud was used on the last 314 ft. of surface rathole and 233 ft. of 17½-in. surface-hole reaming.

After setting 13⅜-in. casing at 1,033 ft., drilling was continued using 11-in. bits. Air injection was stopped frequently to check the effect on penetration rate down to 4,138 ft. From here on down to 8⅝-in. casing point at 7,650 ft., and in the 7⅞-in. rathole to 7,862 ft., air was injected on alternate bits insofar as possible. From 1,152 to 4,957 ft., the mud-circulation rate was maintained at approximately 600 g.p.m. (two pumps), except when one pump was down for repairs. In this section, standard size "jet bit" nozzles were used. Below 4,957 ft., smaller nozzles and reduced mud rates were employed with several bits when air was being injected.

Increased penetration rates due to air injection were apparent from 838 to 3,000 ft. It was noticed that air injection exaggerates the softer drilling breaks, and drilling-rate peaks were higher and usually more sustained with the aerated mud.

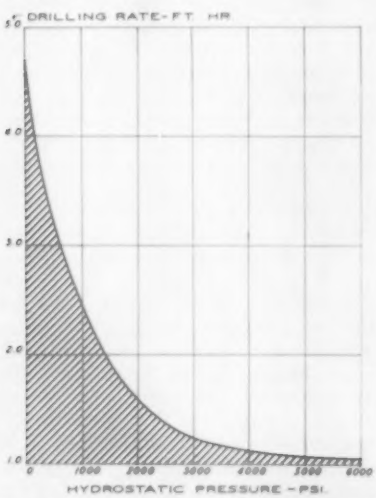


Fig. 1—This comparison of drilling rate and hydrostatic pressure shows why aerated-mud drilling, by reducing the hydrostatic pressure, should increase drilling rate. (Courtesy Hughes Tool Co.)

THE AUTHORS

ROY A. BOBO

G. S. ORMSBY

R. S. HOCH

Roy A. Bobo is director of the drilling-engineering division of Phillips Petroleum Co.'s production department. A native of Oklahoma, he graduated from Oklahoma A. and M. in 1936, receiving a B.S. degree in electrical engineering. He joined Phillips upon graduation and has since served in practically all phases of producing activities. In 1944 he was made assistant regional superintendent with headquarters in Houston, a position he held until his assignment to the newly created drilling engineering division in May 1952.

R. S. Hoch, associate engineer in Phillips' drilling-tools division, Houston, attended Colorado A. and M. and Kansas State, receiving a B.S. degree in mechanical engineering from the latter in 1947. He joined the production department of Phillips in February 1948. After receiving his training in producing operations, Hoch transferred to the company's drilling-tools division in 1949, learning rotary drilling as a roughneck. From June 1950 to June 1952 he served as an engineer in the Odessa office of the drilling-tools division.

George S. Ormsby is assistant director in the drilling-engineering division of Phillips production department, Houston. After studying mechanical engineering for 4 years at University of Texas, he worked in chemical plant and oil-field construction for 2 years. In 1942, Ormsby joined Phillips as a roughneck, was loaned to the gasoline department during construction of the Plains butadiene plant at Borger, and returned to the production department in September 1943. He was assigned to his present job in May 1952.

On the other hand, at the bit weights used in this section, drilling-rate lows were affected negligibly by the injection of air. Statistically, with aerated mud the ratio of averaged peak drilling rates to averaged low rates was 3.2, while this ratio for the mud intervals was 2.1. Peak rates with aerated mud averaged 75.8 per cent higher than with mud; low rates averaged 14.3 per cent higher with aerated mud. These results were obtained with an air-to-mud ratio of approximately 39 cu. ft. per barrel and confirm at least the general trend of laboratory data.

Decreases with depth . . . As discussed previously, the ability of air injection to reduce the average mud weight equivalent of bottom-hole hydrostatic pressure decreases as depth increases. For this reason, air-injection benefits decreased rapidly in the 11-in. hole and were negligible from 3,000 to 4,957 ft. It was found, however, that by shutting down one mud pump to double the air-mud ratio and using small bit nozzles, penetration rates approximately 20 per cent better than with two mud pumps could be obtained.

It will also be seen from the figures that bit life was measurably increased. Average footage per bit from 6,156 to 7,650 ft. was 44 per cent more with aerated mud than with mud. The total horsepower expenditure was considerably less with one pump and air due both to the decreased mud rate and to the decreased standpipe (pump discharge) pressure. Shaft horsepower comparisons are shown in Table 1.

The most promising results of the entire test were obtained in the 7⅞-in. hole after 8⅝-in. casing was set at 7,650 ft. The decreased annular area permitted again cutting the mud rate in half during air injection. This was accomplished by running one pump at approximately half speed, increasing the air-mud ratio to an average of 149 cu. ft. per barrel. Penetration rate varied from 35 to 120 per cent faster with air injection and bit footage life was increased by 50 to 120 per cent. Aeration was stopped May 18 at 9,592 ft. due to insufficient knowledge of underlying formation pressures.

While air was being injected in 11-in. hole between 6,693 and 6,743 ft., mud level in the pits started rising an equivalent of 15 bbl. per hour of formation water. This continued for the remainder of the bit, and the drilling rate increased constantly during the life of this bit. Mud-property variation was no more than normal, and did not

TABLE 1—COMPARISON OF TYPICAL SHAFT HORSEPOWER WITH AND WITHOUT AERATION—1 ODOM "D"

Method—	Circulating rate, g.p.m.	Standpipe pressure, psi.	Pump shaft hp.	Comp. hp.	Total hp.
Two mud pumps, 11-in. hole	600	1,400	755	0	755
One pump and air, 11-in. hole	300	800	216	186	402
One mud pump, 7⅞-in. hole	300	1,200	324	0	324
One mud pump and air, 7⅞-in. hole	150	600	81	186	267

TABLE 2—CORROSION CONTROL SUMMARY—1 ODOM "D"

Hole size (in.)	Depth section ft.	Aeration hours	Anticorrosion chemical cost: Purchase cost	Anticorrosion chemical cost: Cost/cu. ft. hole	Range of mud properties: Chromates, p.p.m.	Alka. pH	Vis. secs.	Weight, lb./gal.	Remarks
17½	838-1,135	13	.....	.....	.....	NR	NR	NR	No protection slight corrosion. No returns.
11	1,135-2,864	62	$1,204.12	$1.05	500 5,600	6.0 11.0	26 28	8.5 9.0	Losing mud intermittently. Adding bentonite, quebracho and driscose. Noted corrosion during minimum protection.
11	2,864-4,981	71	2,560.20	1.83	2,800 5,100	7+ 13.0	28 35	9.8 10.3	Adding quebracho constantly; some driscose and bentonite. Noted corrosion through most of section. Maintaining some viscosity.
11	4,981-6,838	124	2,583.95	2.11	2,000 5,100	10.0 11.5	26 33	9.2 10.6	No mud chemicals or builders added. No corrosion until formation water gained at end of section.
11	6,838-7,650	64	1,382.75	2.72	1,500 4,500	9+ 12.5	27 37	9.2 9.6	Maintaining mud with driscose, Saltgel, bentonite and quebracho. Corrosion throughout section.
7⅞ (Rathole)	7,650-7,862	16	652.50	8.71	4,600 5,800	11.5 12+	32 36	8.9 9.5	Viscosity maintained with total 5¼ sacks driscose. No corrosion.
7⅞	7,862-8,935	84	764.71	1.06	4,000 6,000	11.0 12.5	27 29	8.4 9.2	No mud chemical or builders. No corrosion.
7⅞	8,935-9,591	85	304.25	0.70	4,200 6,200	10.5 11.5	29 ..	8.4 8.9	No mud chemical or builders. Increased drop across bit nozzles. Mild corrosion.
Total cost			$9,452.48						

satisfactorily explain the phenomenon, leaving the possibility that it was caused by a gradual increase in formation porosity. No air was injected on the next two bits with full returns, and subsequent aerated mud drilling indicated that the water zone had been successfully mudded off.

Corrosion control . . . Corrosion was minimized on this test by using caustic soda for pH control and by regular additions of sodium dichromate to the system. Corrosion was noted at various times but the drill pipe was never damaged. Although operating minimums were not definitely established, strong indications existed that chromates were not effective without pH control. Close control of pH with caustic soda proved difficult and carrying high pH without chromates was not attempted. Evidence repeatedly indicated that the corrosion had a peculiar but definite relationship to pressure.

The chromate-high pH combination was expensive to maintain, the total cost of anticorrosion chemicals amounting to $9,452.48. This includes the cost of soda ash which was used in certain sections to reduce chromate requirements. Air was injected for a total of 519 hours at an average rate of 750 M.c.f. per day. Table 2 summarizes the control information by sections of the hole.

Although the data obtained from the 1 Odom "D" pointed up the need for more air to achieve optimum results, it was also apparent that additional worthwhile information could be obtained with the air available. The possibility of using saturated lime water to maintain pH for corrosion control as well as a low viscosity warranted investigation. Continuous air injection while drilling with minimum mud rate to remove cuttings and with small bit nozzles for bottom-hole cleaning would afford an opportunity to test the reliability of special equipment, effect on the hole, and the ability of rig personnel to adapt required techniques.

Third test—2 Glenna . . . Air injection was started June 24 on the 2 Glenna

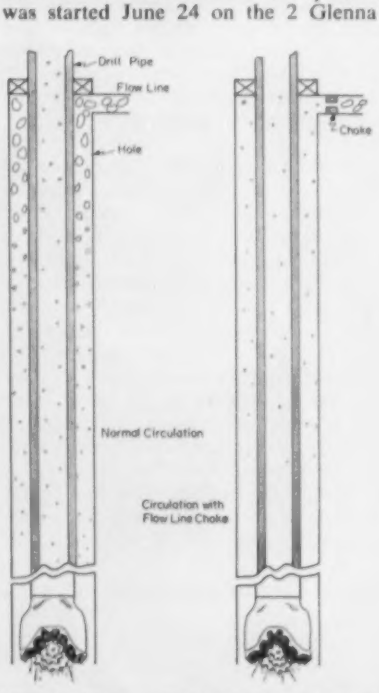


Fig. 2—Quick weight buildup can be attained by shutting off the air and circulating mud, thereby adding to the safety of the operation.

when circulation was lost at 256 ft. while drilling the 17½-in. surface hole. Although the air helped to some extent, the compressor capacity was inadequate for the hole size. Removal of cuttings became a serious problem in the 17½-in. hole each time the mud circulation rate was reduced sufficiently with aeration to regain partial returns and/or increase drilling rate.

After 13⅜-in. casing was set at 981 ft. with an 11-in. rathole to 1,044 ft., drilling continued with aerated lime water, small nozzles, and an air-mud ratio of approximately 65 cu. ft. per barrel until formation-water entry became troublesome below 1,900 ft. Pit level gain amounted to approximately 250 bbl. per hour. Complete loss of circulation occurred each time air injection was stopped.

It was found that, due to difference in compressor capacity between cool night and hot day temperatures at the air intake, the water zone could be approximately balanced with a 420-g.p.m. mud circulation rate during the day and 455 g.p.m. at night. This compared to 300-328 g.p.m. used when water entry was not a problem. Rig time and materials normally required to restore circulation were saved, but the reduction in air-mud ratio to balance the water pressure also reduced the penetration rate advantage of air injection in the interval from 3,500 to 6,907 ft.

With fibrous seal . . . At 6,907 ft. it was decided that the water zone discussed above should be shut off in preparation for cementing casing and aeration was stopped. After returns without air were obtained with mud and conventional lost-circulation mate-

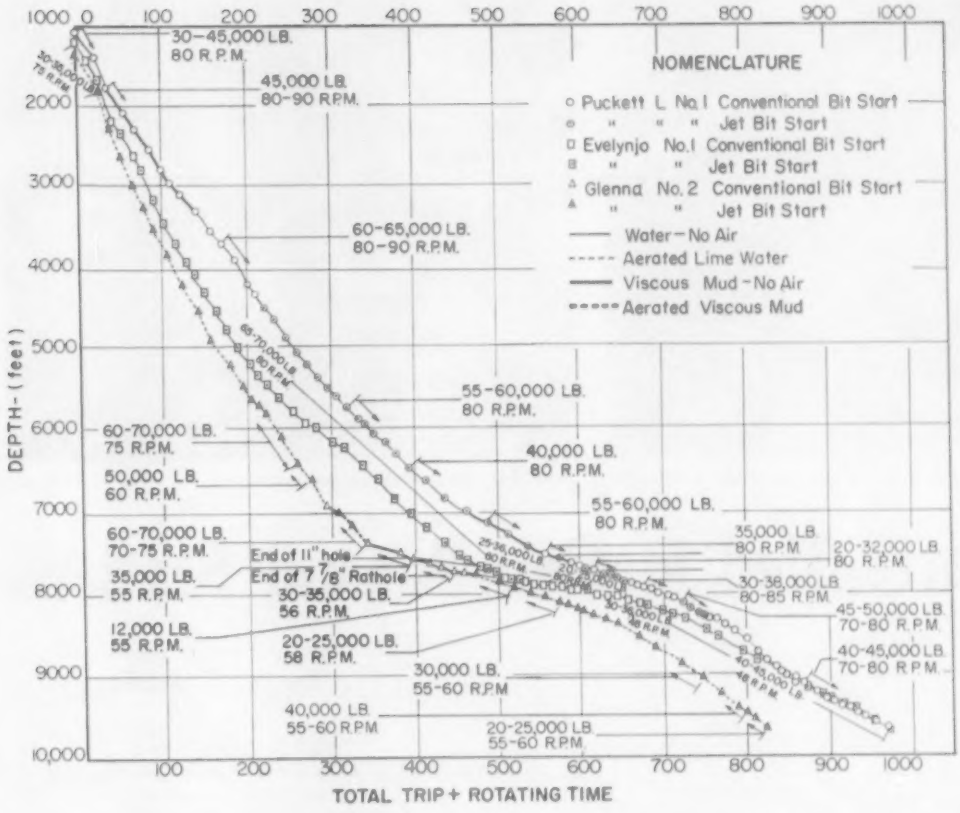

NOMENCLATURE
Puckett L No.1 Conventional Bit Start
" " " Jet Bit Start
Evelynjo No.1 Conventional Bit Start
" " Jet Bit Start
Glenna No.2 Conventional Bit Start
" " Jet Bit Start
Water – No Air
Aerated Lime Water
Viscous Mud – No Air
Aerated Viscous Mud
30–45,000 LB. 80 R.P.M.
45,000 LB. 80–90 R.P.M.
60–65,000 LB. 80–90 R.P.M.
55–60,000 LB. 80 R.P.M.
60–70,000 LB. 75 R.P.M.
40,000 LB. 80 R.P.M.
50,000 LB. 60 R.P.M.
55–60,000 LB. 80 R.P.M.
60–70,000 LB. 70–75 R.P.M.
End of 11" hole
End of 7 7/8" Rathole
35,000 LB. 80 R.P.M.
20–32,000 LB. 80 R.P.M.
35,000 LB. 55 R.P.M.
30–35,000 LB. 56 R.P.M.
30–38,000 LB. 80–85 R.P.M.
45–50,000 LB. 70–80 R.P.M.
12,000 LB. 55 R.P.M.
20–25,000 LB. 58 R.P.M.
40–45,000 LB. 70–80 R.P.M.
30,000 LB. 55–60 R.P.M.
40,000 LB. 55–60 R.P.M.
20–25,000 LB. 55–60 R.P.M.
DEPTH – (feet)
TOTAL TRIP + ROTATING TIME

Fig. 3—Comparison of drilling rates between wells drilled with aerated mud and wells drilled with conventional mud.

rials, and maintained for 200 ft., air was reintroduced at 7,130 ft. and continued to 7,342 ft. to determine whether a seal of fibrous materials and mud would remain in place. Sufficient air was not injected to cause entry of the formation water, but the increased velocity and turbulence due to the air apparently dislodged the seal and circulation was lost. The 11-in. hole from 7,342 to 7,550 ft. and the 7⅞-in. rathole to 7,737 ft. were drilled with mud and no air.

The drilling mud was again converted to lime water after 8⅝-in. casing was set at 7,543 ft. Drilling was routine with small jets (3⅛-in.) and approximately 150 g.p.m. mud pumping rate in the 7⅞-in. hole down to 9,437 ft. where hole trouble started in a slaty shale. Air injection was stopped at 9,662 ft. August 30, and the hole was continued with mud.

The graph, Fig. 3, depicts comparative drilling rates between the third test on the 2 Glenna, drilled with company rig No. 20; the 1 Evelynjo in the same field drilled with company rig No. 32 using clear water; and the 1 Puckett "L," drilled with a Penrod Drilling Co. rig using clear water except as noted. Casing and hole programs were similar, and bit weights and rotary r.p.m.'s were approximately the same with general differences noted on the graph. The jet bits used by Penrod on the 1 Puckett "L" had special small nozzles and necessitated lower pumping rates. With the rig compound, this resulted in lower rotating rates than on the 1 Evelynjo. The same is true of the 2 Glenna.

Computing Trip Time

The drilling time in Fig. 3 consists of net rotating time on each well plus a composite average trip time for each bit. This trip time was obtained by averaging the trip time by depth between the Penrod rig and company rig No. 32. This eliminated differences in rig hoisting equipment and extra time required on the 2 Glenna for adjusting or experimenting with special air equipment. Thus, the graph depicts comparative ultimate results to be expected with the drilling techniques used and the air that was available for the formations encountered.

Lime water good . . . The saturated lime water proved to be effective in controlling corrosion, easy to control, and relatively cheap to maintain. Corrosion was even less than in the second test conducted on the 1 Odom "D." This is attributed to having maintained a pH between 11.0 and 12.5. A total of 33,000 lb. of lime costing approximately $675 was used, and a large part of this was required to maintain pH during the time loss to, and gain from, the water formation which was causing dilution of the system. A white coating, presumably containing calcium carbonte, covered most of drill string, including rubber pipe protectors, during use of saturated lime water. The coating started several stands down the hole and increased in thickness and opacity with depth in the hole.

The belief is often expressed that low viscosity and turbulence are the major factors in creating enlarged holes. Of the 6,569 ft. of 11-in. hole in the 2 Glenna, all but 700 ft. was drilled with lime water and only 500 ft. was drilled without air. Annular volume for cementing was 30 per cent less by caliper measurement than the previous field average. Maximum enlargement occurred in certain lower formations which had been exposed to the least velocity. On the other hand, the 11-in. hole in the 1 Puckett "L," drilled principally with untreated water and no air, was, by calipering, 13 per cent greater in cementing volume than the field average. Although these data are not presented as being conclusive, they are considered to be of significance.

References

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2. The Dynamics of Faulting and Dyke Formations with Applications to Britain-Oliver and Boyd, Edinborough, Revised Edition.
3. How Mud Pressures Affect Drilling Rate, H. B. Woods, The Oil and Gas Journal, September 13, 1954.
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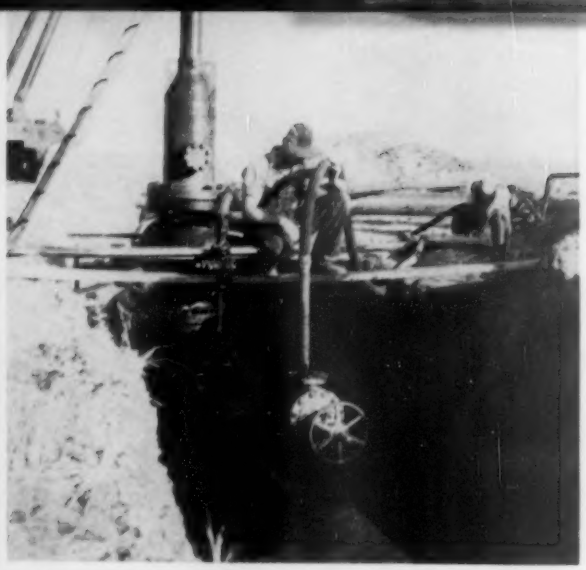
Bypass line is in place and tap is being made for stopple installation.



Blocked-off center section is pumped out prior to cutting and removal.

How Platte Tied in Five Booster Stations

ROUTE of Platte's 20-in. main line and location of boosters which were tied in without shutting the line down. Fig. 1.

by N. J. McGory

INCREASED throughput demands recently made it necessary for Platte Pipe Line Co. to add five booster stations to its 20-in. main line from Wyoming to Wood River, Ill. To accomplish this without interruption of operation or loss of oil, a new technique of big-inch, high-pressure pipe plugging was utilized. During tie-in operations at five points, the pipeline continued to operate at a high rate—exceeding 100,000 bbl. per day—with approximate pressure at the sites ranging from 200 to 400 psi.

The general procedure used in making the tie-ins was to make taps on the line to install a bypass around the station site. Then two stopples (plugging devices) were inserted, one on either side of the station site and between the bypass connections. This blocked off the center section, which could then be replaced with prefabricated sections having gates and connections for the new station. After this was done, the main line was reopened, the bypass removed, and the line placed back in normal operation.

The booster stations tied in by this procedure are located at Harrisburg, Moorefield, and Deshler, Neb.; Hiawatha, Kans.; and Bosworth, Mo. (see map, Fig. 1).

Without the use of the line-plugging device, a lengthy shutdown could not have been avoided. Many miles of the line would have had to be drained from the nearest upstream block valve to the station site or a higher point downstream. Experienced pipeliners will recognize the problems this involves. It was not considered feasible to attempt five tie-ins during a single shutdown. Even with close planning and good fortune in completing the work, lost time would have amounted to many days.

With the use of a line-plugging device, the loss of pumping time and the costly interruption of delivery schedules could be avoided. Also, the tie-ins could be made one at a time so that the entire job would require much less manpower, equipment, and supervision.

How it was done . . . Since the tie-in procedure at all stations was the same, a description of one will suffice. The steps in the general procedure are shown in Fig. 2.

First, two 8-in. internally-threaded tapping nipples with flanges were welded on the line upstream and downstream from the points where the line would be blocked. An 8-in. gate valve was installed on each fitting and a tap made in the line. The 8-in. takeoff from the tap was swaged up to 12-in. immediately, and some 600 ft. of 12-in. bypass line was laid to connect the two taps.

Next, 20-in. split-tee fittings with special "lock-o-ring" flanges were welded on the main line between and next to the bypass connection. These were for installation of the stopples.

The special lock-o-ring flange used is designed for later installation of a plug to seal the tapped outlet (Fig. 3). The inside circumference of the flange has a machined groove which contains four steel segments attached to and moved by bolts operated from outside the flange. The plug is installed in the flange at the conclusion of the line-

Isolated section is replaced with section having station stubs.

Stopples are removed after tie-ins are completed and taps resealed.

Without Shutting Down Its Line

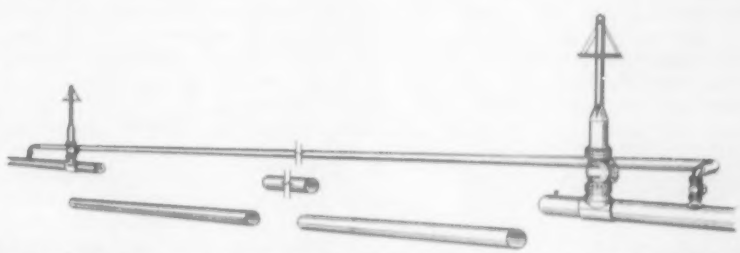
plugging operation, and the segments are locked into place within a matching groove on the periphery of the plug. The segments afford the necessary mechanical strength to hold the plug in place against operating pressure. Complete sealing is effected by O-rings on the plug circumference.

Then 20-in. gate valves were installed at both locations, and a big-inch tapping machine was used to cut a 19-in.-diameter hole within the 20-in. split tee and against the full pressure of the oil flow. The bypass was then opened, the stopples were mounted on the 20-in. gate valves, and the main line was blocked by running the sealing elements into position. The actual seal was made by fluid pressure on the sealing element's flexible neoprene lip (Figs. 4 and 5).

A portable air motor was used to open and close the 20-in. gates during the tapping and plugging operations. Except for the last few turns, the motor was also used to rotate the stopple shaft in extending the sealing element through the valve and into the pipeline. Final positioning of the sealing element required the use of a hand-operated ratchet lever.

Little oil lost . . . At the completion of the plugging phase, a 4-in. tap in the section between line plugs was used for insertion of a suction line to pump out the oil trapped in that section. In the entire operation, the only loss was that which could not be picked up

BYPASS TAPS are made, split-tee's welded on, and tapping machine makes first stopple tap, then . . .



BYPASS LINE is installed, main line is blocked off by stopples, and isolated section is cut and replaced by . . .

SECTIONS for new station. Stopples and bypass are then removed, the taps plugged, and line is back in normal operation. Fig. 2.

EQUIPMENT AND MATERIAL

Other than piping and valves normally required for station installations, the following items were used:

Item 1—Flanged split tees and tapping nipples for 20, 8, and 4-in. taps.

Item 2—Plugs and blind flanges for Item 1.

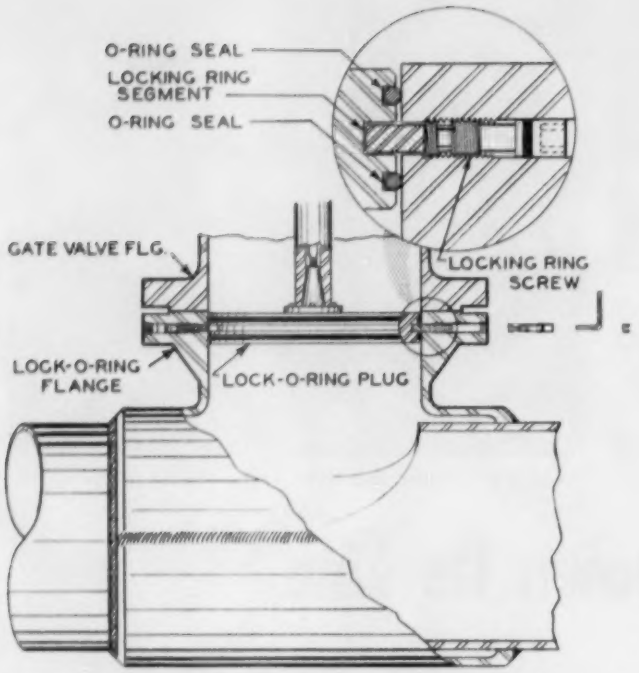
Item 3 — *Tapping machines for 20, 8, and 4-in. taps.

Item 4—*Stopples, 20-in. size.

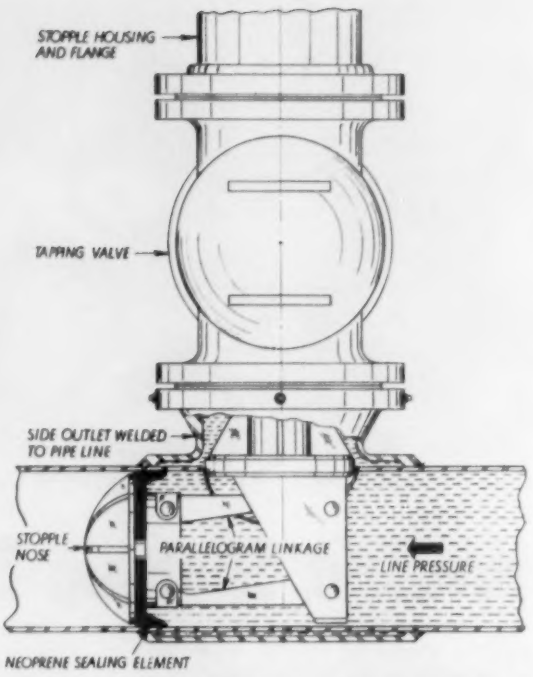
Item 5—Weld-Ends Couplings.

Item 6—Bypass piping and valves.

*These items rented for duration of job



DETAILS OF FLANGE and blinding plug which seals tapped opening after stopple has been withdrawn. Fig. 3.

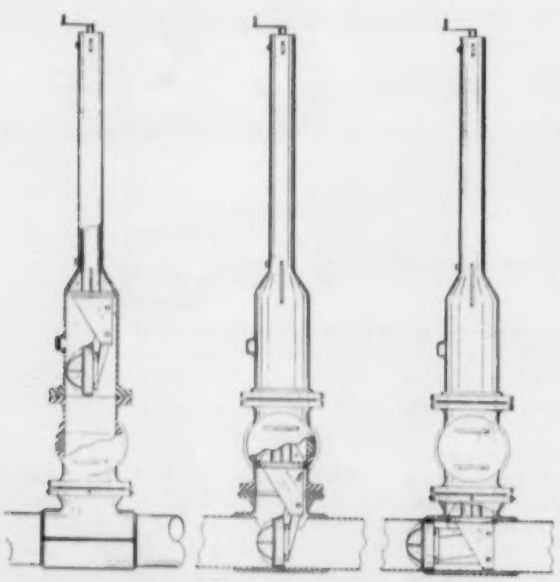


DETAILS of the sealing element in its final position where it withholds line pressure. Fig. 5.

from the removed section and that within the machine housings—a couple of barrels at each location.

At this time, line pressure was raised temporarily by pinching back the downstream station. After this preliminary test of the stopples, pressure was reduced as much as possible for safety reasons, but throughput still remained high through the bypass with a pressure at the station site of 200 to 400 psi.

After testing of seals and removal of oil, two short sections were cut loose with mechanical pipe cutters and removed. Into their places went two prefabricated reverse-bend sections, one containing the station-head gate and the other having a gate and connections for the station suction and discharge lines.



Sealing element is extended through the tapping valve and into the line. Fig. 4.

These sections were tied in with Weld-End couplings. These were installed to form a tight mechanical seal over the open joint and to prevent escape of flammable vapor from inside the line. They were welded to the pipe on either end.

Connections were then made to the station suction and discharge lines, and the newly installed section was filled with oil as the air was bled out. After pressure was equalized, the line was ready for withdrawal of the sealing elements and a return to straight-through operation.

THE AUTHOR

N. J. McGory, superintendent of operations, Platte Pipe Line Co., started his pipelining with Standard Oil Co. of Ohio in 1939. In 1942 he joined Sinclair Pipe Line Co. and reached the position of district superintendent.

He was loaned to Platte in 1950, and worked as material coordinator during construction of the line. McGory was made division superintendent at Casper, Wyo., in 1952, and was transferred to Kansas City in 1954 as superintendent of operations.

Taps resealed . . . At this point, the sealing elements were backed out of the line, the 20-in. gate valves were closed, and the stopples were removed. The lock-o-ring plug was then installed on the tapping machine and the machine was mounted on the valve. Then when the valve was opened, the plug was lowered into the lock-o-ring flange. After the sealing plug was anchored as in Fig. 6, the tapping machine and the 20-in. gate were removed, and a blind flange was bolted in place over the assembly.

Then the bypass valves were closed and the bypass line was pumped out and disconnected, leaving the newly installed section carrying the full line load and ready for the booster station to begin operation.

How Continental Trains Its Geophysicists

Company takes up where schools leave off, and provides formal and on-the-job training

by Harold R. Prescott

GEOPHYSICS is a young profession created by independent thinkers from among engineers, geologists, physicists, mathematicians, and others without benefit of a formal education in geophysics. The training and development in industry has usually been quite informal. It has been left largely to the individual and the natural leaders with whom he associated. Self-improvement through study, association with other similar people, in addition to some informal tutoring by a sprinkling of older, more seasoned explorers has been a natural and effective means of development.

Perhaps the vigor, vitality, and versatility so characteristic of the profession is strongly related to the diverse groups from which its people have come, together with the favorable climate in which natural leadership has been encouraged to emerge by prompt rewards. The diverse approaches of this group to the many complex problems has probably been one important factor in success.

Training program necessary . . . Although schools have begun formal education in geophysics, there are not nearly a sufficient number of graduates to supply industry needs. Furthermore it will always be necessary for the industry to teach its recruits much about the profession, a considerable part of which cannot be done in schools. Unless this is done, the profession will lose its dynamic characteristic so vital to exploration.

Today there is so much more known about the profession than 20 years ago and the number needed to fill the profession through training and development is so much greater than in earlier years that many of us look for improvement in our personnel methods. While the informal approach has much in its favor, the somewhat more formal approach may have more advantages than disadvantages. By the formal approach I refer to training programs and personnel development plans which have a greater degree of preplanning and somewhat more prescribed schedules and studies.

Continental Oil Co. adopted a formal training program in 1948 and continues it to the present. The initial phase, in which most our college recruits participate, follows a prescribed course lasting at least 12 months but usually not more than 18 months. Most of this period is spent with the seismic field crew. During this initial phase, the recruit is usually a supernumerary for the reason that the nature of assignments frequently change and proficiency is not apt to be acquired in any of them.

On the job . . . A group of about 30 study units is provided, associated with the recruit's on-the-job training assignments. These assignments include indoctrination in administrative matters. These assignments include highlights of project planning and execution. They include field experience in permitting and surveying, shot-hole drilling, and shooting. They include considerable time on the recording unit and in the field office on computations and interpretations, together with study units in basic principles involved. For the recruit primarily interested in interpretation, about a 3-month assignment is included in one of our regional or divisional geophysical offices. For the physicist or engineer primarily interested in research or equipment design, about a 3-month assignment is included in our geophysical laboratory.

At successful completion of this first training phase, assignments are thereafter made to a job with sole responsibility for the performance of the job. It is thought necessary at this point for each young geophysicist to begin solely to accept and discharge all responsibilities of each assignment as a necessary part of his own growth and improvement. At this point, further training tends to lose its formality but rotation schedules and assignments to new geographic areas are continued.

Advance to party chief . . . The majority of these young geophysicists complete their interpretive experience and are then promoted to party chief. We try to do this for our young engineers and physicists, even though their primary interest may be the design of exploratory tools, as a very desirable background for their future work. We always do this for those scheduled to become geophysical supervisors as an exceptionally important part of their development.

Experiences gained during party chiefing are unusually important. We consider it the most important job in geophysics in terms of what it does to develop people. Our party chief must handle both public relations and employe relations, including problems involving employes' families. He must handle a large variety of both technical and nontechnical matters. He must earn the respect and cooperation of nontechnical employes, many of whom are older and have more years of experience. He must lead the crew to proper work effort and high technical performance. He is the key man in training and developing young recruits. The caliber of a field crew is just about what the party chief makes it.

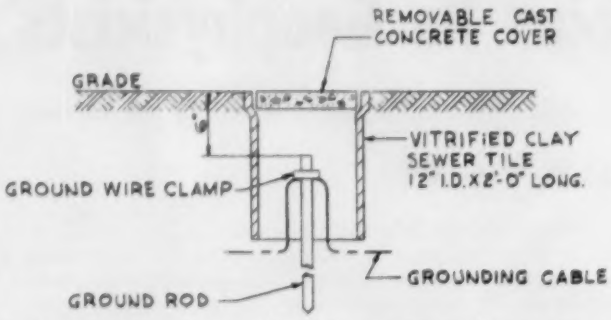
Following a successful assignment of party chiefing, we normally assign the young geophysicist to one of our division or regional offices where useful problems are worked, integrating geology and geophysics. During this assignment, a few selected experiences in geological work are frequently planned. The purpose of this assignment is to make an explorationist of our young geophysicist with appreciation of the relation of land, geological, geophysical, and economic factors.

A formal personnel training and development program will require a lot of effort in any organization, but the results justify the cost and effort. When Continental's organization chart is reviewed, the caliber of young men holding important positions who have gone through this program is impressive. It has stimulated the old timers and certainly has made it possible for them to multiply their own efforts.

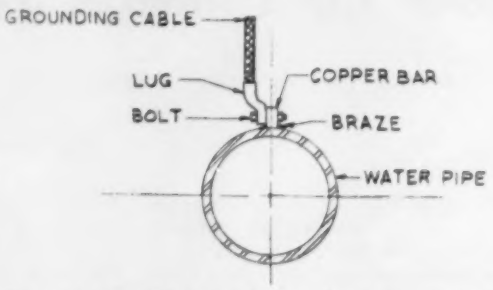
THE AUTHOR

Harold R. Prescott, manager of the geophysical section, Continental Oil Co., received his B.S. degree in electrical engineering from University of Kansas in 1927. He has been engaged in geophysical work since 1927, when he was employed by Marland Oil Co. in connection with gravity pendulum development. Employment continued with Continental Oil Co., following its merger with Marland, in the capacity of development geophysicist. In 1949 he became assistant manager of the geophysical department of Continental and in June 1951 was promoted to his present position.

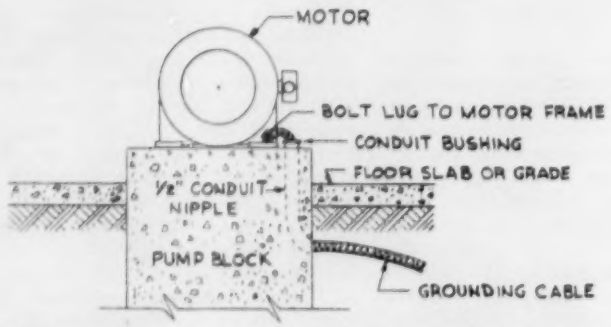
This article was originally presented as a paper at the eighth annual midwestern meeting of the S.E.G.



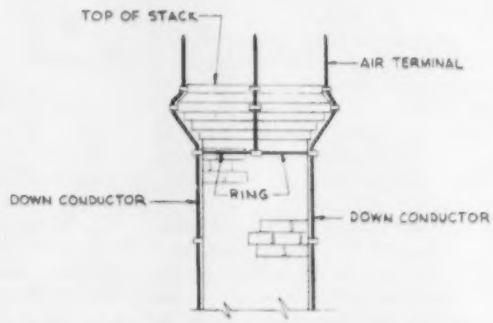
Connections of ground systems should be accessible for checking. Fig. 1.



Be sure to coat this type of connection to prevent local corrosion. Fig. 2.



Grounds to motors need physical protection as afforded by this type installation. Fig. 3.



Tall, nonconducting structures should have protection from lightning damage. Fig. 4.

Prevent those "shocking" conditions

Check Up on Ground Connections

A corroded or loose ground connection seems relatively unimportant but it could result in a disastrous fire or serious accident. Is the grounding system in your plant safe?

by Ernest C. Benjamin and James V. Cundelan

DESPITE comprehensive provisions in the National Electric Code, numerous accidents and occasional deaths are reported each year due to faulty equipment grounding. Inadequate grounding in oil refineries and chemical plants offers a particularly serious hazard because of the very nature of the process, equipment, and structures involved. Therefore, it behooves engineers connected with process plants to carefully consider the plant's grounding system to assure that maximum security and protection are being afforded.

Large sums are spent each year in refineries and chemical plants to provide electrical systems for safe operation in the presence of flammable or explosive vapors and liquids. All equipment subject to arcing is either carefully enclosed in a flameproof and explosion-resistant housing, immersed under oil, placed in a pressurized switch room, or located entirely apart from the immediate area of potential hazard. There is no question of the wisdom of these extreme precautions in dealing with the potentials of explosion and fire but we must also appreciate the fact that lack of proper equipment grounding may create the very conditions which we attempt to avoid.

Authors are associated with M. W. Kellogg Co. Condensation of a paper presented at the American Institute of Electrical Engineers Petroleum Industry Electrical Conference, Tulsa, September 27-29, 1954.

What is meant by equipment grounding? Article 250 of the N.E.C. (National Electric Code), in essence, requires that exposed conductive materials enclosing electric conductors and electric equipment, or forming a part of such equipment, shall be grounded for the purpose of preventing a difference of potential between the equipment and ground. Also, that potential differences between various elements of the system and earth be eliminated or at least limited to safe values.

The elements of an equipment grounding system may be reduced to two essentials, the connections to earth, or grounding electrodes, and the connections to equipment frames, conduits, or enclosures. These two essentials are connected together by either a cable ground loop or a grid system. The components are described below.

Grounding electrodes . . . Usually, in plants such as those under consideration, one or more underground metallic

water lines will be installed. The N.E.C. stipulates that, where such pipe is available, it shall be used as the grounding electrode. Buried plate, driven pipe, and rod electrodes are acceptable, but when installed should be imbedded below permanent moisture level since it is desirable that electrodes have as low resistance to ground as practicable. Values of resistance to ground in excess of 25 ohms are undesirable and should be lowered by the use of multiple electrodes or by other means.

In practice, grounding electrodes in refineries and chemical plants usually consist of water lines, driven ground rods or a combination of both.

Fig. 1 illustrates a typical ground-rod electrode installation. It should be noted that the construction is so designed that easy access is possible and that the conductor may be removed from the ground rod to facilitate testing.

Fig. 2 illustrates a typical grounding connection to water pipe. Because of the low resistance to earth of such pipes no provisions are made for access and testing of the efficiency of the grounding.

Connections to equipment . . . Connections between fixed equipment to be grounded and the grounding electrodes are usually made with stranded copper conductors, ranging from No. 8 to 3/0 A.w.g., depending upon the size of the service conductor. An exact size of grounding conductor could also be determined by the maximum-available fault current and the interrupting time of the circuit protective device. For practical reasons, many engineers specify a single conductor size for the entire grounding system.

The actual grounding connections usually take the form of a loop joined by short cable connections to the individual equipment, and then connected at one or more points to grounding electrodes. This main grounding loop, or bus, which will serve motors, lighting panels, motor control, and other electrical equipment, should be buried at least 18 in. below finished grade. All below-grade connections to the ground bus should be made by copper brazing, fusion welding or an equivalent process capable of sustaining reasonable temperature. Underground bolted connections should be avoided because of the danger of high-resistance joints due to corrosion.

Grounding of motors is best accomplished by drilling and tapping the motor frame after which the grounding conductor, equipped with a copper terminal, may be bolted directly to the frame. Satisfactory protection from physical damage may be afforded the grounding conductor, if a suitably formed length of ½-in. conduit has been cast in the pump foundation block. Fig. 3 illustrates this clearly.

The top of the conduit should project at least 1 inch above the top surface of the block and the other end should be brought out of the side of the foundation block several inches below the underside of the finished floor. The ground wire may then be easily threaded through the conduit.

Similar grounding connections should be provided at lighting panels, motor starters, switchboard frames, and all other metallic enclosures and supports of electrical apparatus.

A point sometimes overlooked by the designer is the case of conduits terminating just above grade in motor-control centers and cubicle-type switchgear. Since such conduits are not connected electrically to the equipment, they should be strapped together and connected to the enclosures or to the equipment ground bus if one has been provided.

Portable equipment . . . It is usual practice in petroleum and chemical-plant installations to include a system of convenience outlets providing local sources of power for portable equipment. Generally, a single-phase system employing 120 volts to ground is used, although potentials as low as 24, 32, or 48 volts are frequently found. The use of these lower voltages, definitely lowers the danger to operating and maintenance personnel but does not eliminate the possibility of undesirable arcing in hazardous areas in case of equipment failure.

Portable equipment should be grounded by means of a separate grounding wire in the connecting cable, of current-carrying capacity equal to that of the line conductors. The plug and receptacle should be equipped with special grounding contacts. In existing plants equipped with two wire receptacles, the third or grounding conductor in the connecting cable may be furnished with a spring clip which may be attached to grounded structural members or grounded steel conduit. The use of small lugs designed to be slipped beneath a screw head is undesirable since personnel habitually neglect to make this type of connection.

Welding machines . . . In recent years, a system of welding receptacles operating on three-phase systems energized at voltages up to 550 volts has found increasing favor in petroleum and chemical plants. While welding is usually performed during shutdown periods thus reducing danger of explosion or fire, hazard to personnel may still exist unless proper precautions are taken to adequately ground the welding sets. This can best be accomplished by the use of a separate ground wire in the connecting cable and grounding contacts in the power plug and receptacle.

Substations . . . Even though substations are generally located away from process areas in petroleum plants, and thus are removed from explosive vapors, certain precautions should be observed to reduce the possible danger to personnel. A satisfactory grounding system may be achieved by burying a ground cable around the substation area and connecting it to ground rods at frequent intervals. In larger substations, a grid may be formed by installing several ground cables across the substation area.

All electrical equipment, i.e., switchgear frames, transformer cases, steel racks, and supporting structures, should be connected to the ground bus. Fences should also be connected to the bus at frequent intervals.

Lightning Protection

Lightning can be responsible for damage of two types: one the destruction resulting from a direct stroke and the other, the impairment of equipment due to surges in the electrical system, caused either by direct strokes to power lines at some distance from the plant, or by electrostatically induced voltages.

Complete positive protection from lightning hazards is not possible from a practical standpoint. However, we do have at our disposal, methods and equipment to minimize the likelihood of serious damage resulting from lightning. Our problem, then, lies in taking economical, practical steps to achieve our purposes.

Pole lines . . . A high degree of protection for power lines feeding a plant can be achieved by the installation of lightning arresters on the line side of substations fed from overhead lines and at the terminus of an overhead line. Further protection for more extensive overhead systems may be obtained by the use of the overhead ground wire system.

This method of shielding live conductors on pole lines has been very successfully employed through the years; its effectiveness, however, depends upon several factors. Ground resistance must be low and the installation so designed that live conductors are not only widely spaced from the ground conductor but, for maximum protection, within a shielded area below the ground wire. It is generally accepted that the shielded area is that space included in an isosceles triangle having the grounded conductor as its apex and its base angles of approximately 30°.

Motors . . . Under some conditions, it is desirable to provide individual motors, particularly those of larger size, with additional protection from lightning impulses. It is preferable to install the protective devices as near the machine to be protected as possible. This objective cannot be fully realized in hazardous areas since surge protective equipment is not readily available in explosionproof construction but it is usually feasible to find some point either in or near the process area, however, where such protective equipment may be safely installed.

Structures and buildings . . . Since most of the structures in refinery and chemical plant units are of steel, a high degree of protection is possible by the simple expedient of grounding the steel frame work in several places. Such structures may be considered as self-protected against lightning strokes.

High structures create a zone of protection about their bases which is conventionally taken as the space enclosed by a cone, which has its apex at the highest point of the structure and a radius at the base equal to the height of the structure in critical cases, or up to twice the height in those of lesser importance.

Vessels and tanks . . . Properly grounded steel vessels and tanks are essentially self-protecting or may be considered protected if located in a zone of protection as defined above. Certain definite precautions should be observed, however, in the protection of the vessel and its contents as follows:

1. Flammable liquids and gases should be stored in all-metal structures, essentially gastight.

2. Vapor or gas opening to the atmosphere should be protected against the entrance of flame.

3. The accumulation of flammable air-vapor mixtures in or in the vicinity of such structures should be avoided.

4. Positive metallic contact of piping to vessels to eliminate spark gaps at points where there may be an escape or an accumulation of flammable vapors must be assured.

5. Vessels not inherently self-protecting should be located, if possible, in positions of minimum exposure with respect to lightning.

6. In extreme cases, it may be necessary to establish zones of protection through the use of grounded masts and overhead grounded networks of wires or other similar provisions making up a protective cage.

Chimneys and stacks . . . Metal chimneys and flare stacks need no protection against lightning other than afforded by their construction, provided they are properly grounded. In such stacks, it is desirable that metal guys be grounded at their lower ends. Guy wires attached to steel anchor rods set in the earth may be considered as sufficiently well grounded but those set in concrete or nonconducting supports should be provided with additional grounding.

Special precautions must be taken with chimneys and stacks of nonconducting materials such as brick, tile, or concrete. It is customary practice to install air terminals (lightning rods) uniformly about the top rim of the stack at intervals not greater than 8 ft. The air terminals should be connected together about 2 ft. below the top of the chimney and then connected to ground by at least two down conductors installed on opposite sides of the stack.

Where stacks have a metal lining, the lining should be connected to the air terminals at its upper end and grounded at the bottom. Reinforced-concrete stacks should be treated as above, but in addition, the reinforcing metal should be electrically connected together and bonded to the down conductors on the outside of the stack at the top and bottom.

Typical arrangement of air terminals on a stack is shown in Fig. 4.

Static Charges

Potentially hazardous static charges may accumulate due to a number of causes, among them, the movement of gases and liquids, the spraying of caustic solutions in tanks, acid bubbling, and even certain phases of the processes themselves. Liquids in a tank, if agitated, may accumulate static charges. It has been noted that liquids discharging from a pipe above the surface of the liquid in a storage tank will produce static charges in the liquid.

Fortunately, we have learned to deal with most of the problems presented. The belt-driven equipment may be a definite hazard in process areas and its place has been taken by direct and gear drives or reciprocating equipment. Static caused by the flow of gases or liquids in piping systems is probably carried off harmlessly by the piping itself. Potentials may also be dissipated through pipe hangers and other supports electrically bonded to grounded structures. On occasion, however, it may be necessary to provide additional grounding for certain piping. This can usually be best determined after plant operation has begun.

Grounding Systems and Corrosion

The authors feel that one aspect of our present grounding methods deserves further consideration. Let us review our practices for a moment.

We are all aware of the network of underground conduits and metallic piping which exists in most process units. Current grounding practices usually call for the installation of bare stranded copper conductors for direct earth burial and copper-clad ground rods.

To save additional excavation, it is usual field practice to install grounding cables in the same trench with steel conduit and other underground piping. The conduit system has already been connected to the grounding system and the N.E.C. has required the connection of underground water piping to the same system.

The electrolytic nature of the soil gives rise to a galvanic corrosion cell in which the buried steel pipe or conduit is the anode, while the bare copper cable or copper-clad ground rods act as the cathode. Since the circuit is completed by the copper grounding cable, current flows through the soil from the steel to the copper. Wherever current leaves the steel a corrosion pit results.

The corrosive action of such a cell may be reduced or retarded by either one of two relatively simple expedients. The first scheme consists of providing the grounding cables with an insulating jacket, generally of neoprene or a plastic such as polyvinyl. The alternate method consists of substituting zinc rods or electrodes for the copper-clad steel rods. Since zinc is definitely anodic to steel, the polarity of the galvanic cell is reversed; that is, the sacrificial corrosion of the zinc ground rods (which can be periodically replaced) affords cathodic protection to the buried steel piping or structures.

A more elaborate scheme which incorporates both protective measures, has been recently completed at the Fairless Works of United States Steel Co. near Morrisville, Pa. In this grounding installation, all wire, though copper, is neoprene covered. Ground beds consist of grids made up of driven steel rods plus magnesium anodes which serve the dual purpose of providing low-resistance grounding and galvanic protection for the steel ground rods.

All joints in the copper cable are carefully wrapped with neoprene tape as are the cable connections to the electrodes. Every effort is made to reduce contact of the copper cables with the soil. It is probable that this system will result in greatly lowering the corrosion rate of underground metallic structures.

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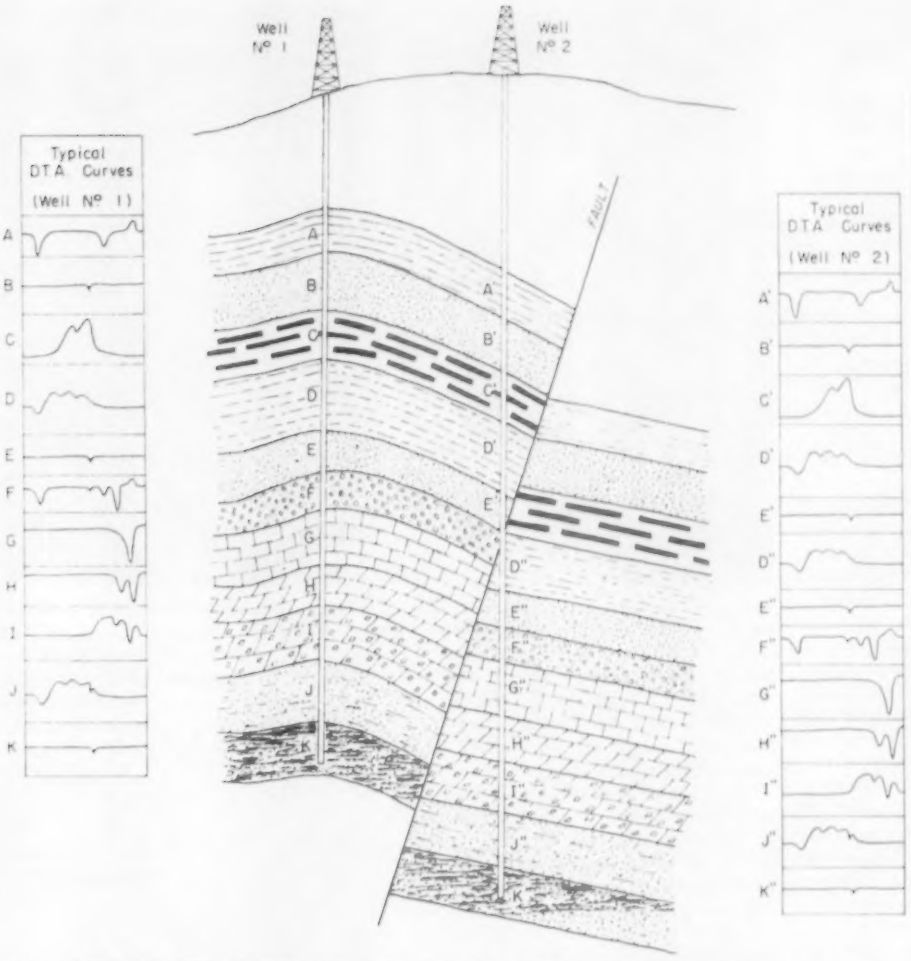


Fig. 1—Schematic diagram illustrating how D.T.A. logs can be used to correlate zones between two wells.

FORMATIONS INDICATED

A. Bentonitic clay
B. Sand
C. Lignite
D. Shale
E. Sand
F. Conglomerate
G. Limestone
H. Dolomite
I. Pyrite and dolomite
J. Sandy shale
K. Oil sand

Differential Thermal Analysis Offers New Formation-Correlation Tool

by George B. Mangold

A NEW method for correlating formations, one based on thermal characteristics of minerals in the zones, is showing promise of becoming a useful, inexpensive tool for obtaining greater insight into subsurface conditions.

The method, differential thermal analysis, gives results in terms of mineral composition of cuttings and/or cores coming from the formations being drilled. No stoppage of drilling is required. Correct sampling is necessary, however, if the results are to be truly indicative of the formations penetrated.

Differential thermal analysis (D.T.A.) is the process of recording the thermal reactions of minerals as they are heated uniformly from room temperature to at least 1,000 °C. Loss of crystallized water, change of state, crystal rearrangements, decomposition, oxidation, and formation of new compounds are the types of reactions which absorb or liberate heat. One or more of these reactions occur with most minerals. The

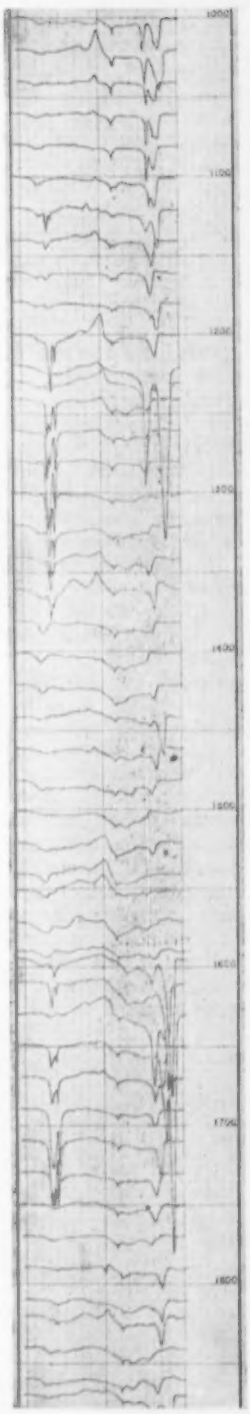


Fig. 2—Portion of an actual D.T.A. log, showing several definite zones which might serve as correlative markers.

amounts of heat energy involved are characteristic of the minerals and therefore provide an excellent means of identification and comparison.

Each sample is compared directly with an inert standard, such as calcined Al_2O_3, through the use of "differential thermocouples" so that only the deviations from a uniform temperature rise are recorded. When no thermal reactions are occurring, the D.T.A. curve coincides with the "base line"; in other words, the sample is at the same temperature as the inert standard. Equipment has been developed to enable the simultaneous heating and recording of thermal reactions of six samples over a temperature range from room temperature to over 1,000 °C.

Continuous Log

Presentation of the D.T.A. curves is made in the form of a continuous log approximately 3 in. wide, with the base line of each sample plotted horizontally according to the depth of the sample. Deviations from the base line show up as peaks upward or downward from a horizontal line, representing exothermic and endothermic reactions respectively.

If cuttings or core samples are obtained at intervals of 20 ft. or less, the continuous D.T.A. log will indicate compositional trends and breaks, maximum and minimum concentrations of particular minerals, and appearance of organic matter, clays, quartz, etc. Even without knowing the actual mineral makeup of complex formation materials, they can be correlated from well to well by comparison of the thermal curves. An experienced observer can obtain much additional information from the D.T.A. curves. Unusual core properties, drilling difficulties, and effects on drilling mud and cement may be explained.

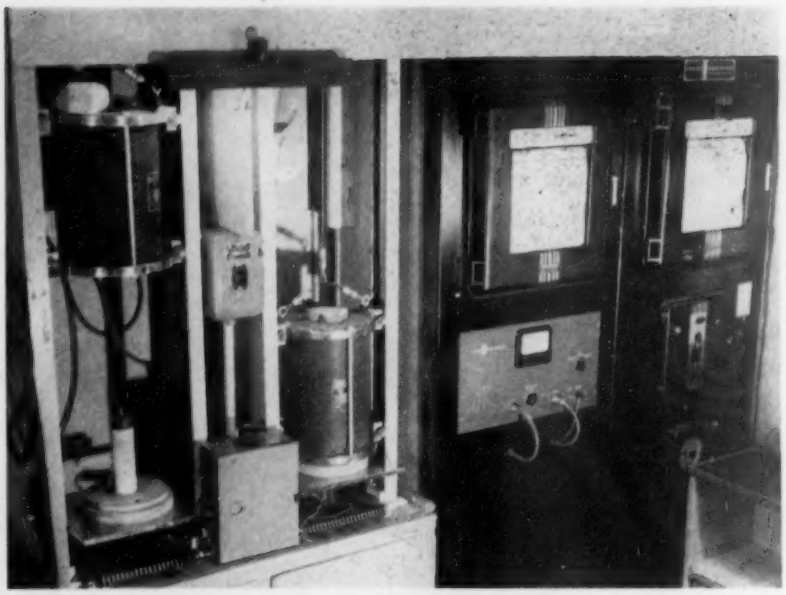
Fig. 1 is a schematic diagram illustrating how D.T.A. logs may serve to correlate zones accurately between two wells, and to locate faults and folding of strata. Well No. 1 is shown penetrating a series of zones, A through K. At the left edge of the diagram are miniature D.T.A. curves typical of those that might be determined from cuttings from each zone.

Well No. 2 is shown penetrating the same formations but at such a spot that it traverses a fault. Typical D.T.A. curves of the zones penetrated by this well are shown at the right.

From A′ through E′ the D.T.A. log would be almost identical for the two wells and give obvious correlation. A study of the thermal curves below E′ would show that zones D″ and E″ are repetitions due to faulting, and correlation could be picked up again at F″ and continue to total depth. Thus a complete correlation between the two wells, the location of the fault, and a measure of the displacement along the fault can be achieved.

Fig. 2 shows part of an actual D.T.A. log. Several definite zones and breaks are visible, with strong correlative markers. The double endothermic peak at the right end of the curves shows dolomite. It is present from 1,000-1,230 ft. and 1,595-1,670 ft., with concentrated stringers at 1,220 ft. and 1,630 ft. Gypsum is indicated by the sharp double peak at the left end of the curves. It is prominent in two zones, 1,200-1,360 ft. and 1,595-1,730 ft., and in a stringer at 1,120 ft.

Calcite or limestone, portrayed by a single endothermic peak at the right, exists in many of the samples with an exceedingly high concentration at 1,610 ft. Quartz is present throughout most of the samples, as indicated by the small but sharp endothermic peak just to the right of the center of the curves. Shales and clays appear between 1,520 ft. and 1,630 ft., as evidenced by loss of hydrated water, by low-temperature exothermic peaks, and by lattice breakdown reactions. There is also evidence of a masking of reactions in the intervals 1,400-20 ft., 1,480-1,570 ft., and 1,840-60 ft. due to halite (salt).



Differential-thermal-analysis equipment, showing furnaces and sample holders, left, automatic multiple recorder, and furnace-temperature controller, right.

Identification Difficult

When a complex grouping of minerals occurs, it is sometimes impossible to identify the individual ingredients. This does not in any way lessen the value of the curves for correlative purposes. As concentration is lowered by the presence of other minerals, both amplitude and temperature of a peak are reduced. As long as reaction does not occur between the various minerals in an assemblage, the thermal peaks due to each individual mineral will appear proportionate in size to the concentration of that mineral and the amount of heat energy involved in the process.

In the case of halite, there is an effect in addition to the proportionate lowering of concentration of the other minerals. In the presence of carbonates, the right-hand or high-temperature portion of the curve is pulled upward in an exothermic direction, and the temperature of calcite or dolomite peaks is very substantially reduced. This is evident in the halite zones discussed above. So the over-all picture of this D.T.A. log includes two gypsum zones, two dolomite zones, a shale zone, salt occurrence in three places, and limestone markers—all of which would serve admirably for correlative work.

In addition to its use for zonal correlation, many other applications of

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D.T.A. have been developed. Great progress has been made in the recognition of geologic age from thermal curves, and agreement with paleo correlations has been excellent. Otherwise unaccounted-for peaks and kicks on electric logs have been explained, lithology observations checked or refuted, unusual core-analysis data sustained by thermally-determined composition, and potential corrosion-producing environments (such as those containing sulfides) located and defined. If a complete D.T.A. log has been run for a well, it is possible to identify solids produced in conjunction with the petroleum and determine the source depth of this material, which may or may not be the production zone. This can be the means of locating casing defects and the saving of much labor and materials.

Sampling techniques . . . Whereas the actual mechanical process of recording D.T.A. curves does not involve the human element and its accompanying sources of error and variety of interpretation, the procurement of sample does—and must therefore be carried out under rigid control.

The D.T.A. curves can be no better nor more accurate than the sampling technique. Where poor samples are obtained, poor D.T.A. logs result and correlation is doubtful. But when proper sampling procedures are followed, D.T.A. results have been excellent.

Petroleum Engineering Associates, Inc., and its field service, Lith-O-Log, Inc., has established a technique for the sampling of cuttings which involves: (1) accurate knowledge of lag time at all depths; (2) collection of cuttings over an interval of 5 ft. preceding each 10 ft. of drilling; (3) careful and thorough washing of the cuttings on a 150-mesh screen; and (4) drying at a temperature below 180° F. Occasional pieces of formation dislodged up the hole and appearing in the cuttings are usually obvious and must be discarded. In the laboratory, the samples are checked and ground to 60-150 mesh before loading into the D.T.A. furnace sample holders.

Sampling from cores also involves certain procedures. Single small pieces do not usually produce good D.T.A. correlation because of the unlikelihood that such pieces are representative of the full interval being logged. If continuous cores are available, the accepted technique involves procurement of sections at 1 ft. intervals and compositing these samples over a depth of 5 ft. to yield a more representative sample.

In this way, very thin stringers which are of little value for correlation are given no more prominence than their proportion justifies, whereas major formation trends and breaks appear without a superficial camouflaging by these minor compositional ingredients.

With correct sampling such as has been briefly described here, whether used by itself or in conjunction with other logs, D.T.A. can provide the operator with a wealth of information that was formerly lost at the base of the shaker screen.

New Gasoline Plant Designed For Minimum Operating Costs

- **Boilers are eliminated**
- **Hot oil is used for heating**
- **Maximum use is made of aerial cooling**

by L. E. Woodruff

THE TEXAS CO. recently put in operation a gasoline plant located on the Wayside Honor Rancho of the Los Angeles County Sheriff's Department, near Castaic, Calif.

The plant is currently handling about 13,000 M.c.f. per day of wet gas produced from Honor Rancho and Castaic Hills fields and is making 6,500 gal. of propane, 8,200 gal. of butanes, and 9,200 gal. of 16-psi. R.v.p. gasoline per day.

Some of the features incorporated in the design include elimination of boilers, the use of hot oil for heating, the use of fuel gas to provide power for process pumps, and a maximum use of aerial cooling. Steam is generated in finned-tube sections.

In the early stages of studying this project, estimates of gas-production rates and potential liquid production indicated that if a gasoline plant were to be economically successful in this area it would be necessary to keep the installing and operating costs at a minimum. Consequently, an effort was made to keep the design as simple as possible. The still is operated at relatively high pressure to avoid recompression of uncondensed still vapors. Propane is taken off as sidestream on the depropanizer.

Process

As pointed out, the process design was chosen for its simplicity. Wet gas is compressed from a pressure of about 20 psig. to an absorption pressure of 340 psig. in two stages. Noncondensables are reduced in the fat-oil stream by simple venting in two stages, first at the absorber discharge after a pressure reduction to about 220 psig. and second after the oil stream has passed through the first bank of heat exchangers and been heated to about 200° F. The vented vapors together with uncondensed still vapors are compressed with the wet gas in the second stage of compression and returned to the absorber.

Gasoline fractions are removed from the oil in a single still, the feed for which is heated in a fired heater.

Raw gasoline or still condensate goes first to a depropanizer where the isobutane and heavier fractions are removed as a bottoms product and propane is removed as a sidestream product. A gasoline debutanizing column separates the isobutane plus into a mixed butanes product and a natural gasoline of about 16 psi. R.v.p.

Still

In a process of this type, one of the important considerations is obtaining sufficient condensation of the lighter fractions removed from the oil in the still. This can only be accomplished by maintaining a relatively high condensation pressure, which means that either the still must be operated at a high pressure or else uncondensed still vapors must be recompressed. In this case it was decided to operate the still at the relatively high pressure of 175 psig.

Effective stripping of the oil at this pressure is accomplished by the use of less than 0.25 lb. of steam per gallon of oil with the feed being heated to 515° F.

Steam generation . . . No steam is used in the plant except that used for strip-

Author is with The Texas Co., Los Angeles.
Paper presented at C.N.G.A. meeting at Los Angeles October 7-8, 1954.

ping the oil. This is generated not in conventional boilers but by exchange with the hot oil from the still. The steam generator consists of six parallel banks of finned-tube sections arranged so that water circulates by thermosiphon through the inside of the tubes between a mud drum below and a steam drum above the sections. The oil enters the exchangers from the still at about 485° and normally the generation of steam reduces the oil temperature approximately 60°.

Steam condensate recovery . . . Because of the hardness of the water available at the plant site (22 grains per gallon) every effort was made to recover and reuse as much of the steam condensate as possible. Water from the still reflux accumulator, the still bootlegs, and the second-stage fat-oil vent tank is returned automatically through an oil-water separator to the steam-generator feed-water heater. Even the water which accumulates in the bottom of the absorber is not drained off but is permitted to carry on through to the vent tank. Normally, the only water drained out of the system is a small amount of blowdown from the mud drum.

Makeup water . . . This is obtained from the gas. Gas from the second stage of compression is finally cooled in the water-cooling tower and then passes through a scrubber where water and gasoline condensate are accumulated. The water is bled off automatically to a soft-water storage tank. Since this water comes into the plant in the gas in the vapor state, it is relatively pure. A small water softener was also installed but is not normally needed.

Product Fractionation

Raw gasoline from the still condenser is pumped into a product depropanizer where the feed is separated into a non-condensable overhead stream consisting of methane, ethane, and some propane; a propane product taken off as a sidestream; and an isobutane plus bottoms.

High depropanizer pressure . . . In order to obtain a satisfactory retention of propane this column is operated at 360 psig., which is considerably higher than the operating pressure of most depropanizers but less than is customary for deethanizers. At the present time the pressure is set just high enough to return the uncondensed vapors to the absorber. The column has been designed for 400 psig. and operating pressure can be raised to that limit. Operating what is primarily a depropanizer at these pressures increases the reflux rate necessary for the separation of propane and isobutane but in the case of a small plant such as this, this disadvantage is more than offset by the advantage of single column operation.

"Hot lean oil from the still provides heat for generating process steam and for reboiling. No reheating or recirculating is necessary . . . Lean-oil and cooling-tower-water pumps are gas-engine driven."

Dry propane product . . . Another advantage which is obtained when propane is removed as a sidestream rather than as an overhead product is that with a reasonably well dehydrated feed it is possible to make a dry propane product. This is true because the vapors leaving the top of the column are capable of carrying off a considerable amount of water vapor, most of which condenses in the reflux condenser and is drained from the reflux accumulator. So long as the amount of water entering the column with the feed is less than that required to saturate the overhead vapors, the liquid on the trays will be dry.

Oil Heating System

Hot lean oil from the still provides heat for generating process steam and for reboiling. No reheating or recirculating is necessary. The oil flows directly from the still to the steam generator, then to the depropanizer and debutanizer reboilers successively, and thence to the rich oil-lean oil exchangers.

Gas-driven pumps . . . Plant fuel of necessity comes from the absorber residue stream at about 335 psig. In order to utilize the energy available between this pressure and fuel pressure, fuel gas is used to drive as many of the process pumps as possible, namely the depropanizer feed, depropanizer reflux, debutanizer reflux, and steam-generator feed-water pumps. Still reflux pumps are electric-motor driven. Lean-oil and cooling-tower-water pumps are gas-engine driven.

Cooling . . . Aerial cooling has been employed as much as possible. The primary still condenser, gasoline debutanizer condenser, and compressor coolers are aerial coolers in which the fans are driven by two-speed direct-connected electric motors.

Cooling for the final still condenser, the lean oil, the depropanizer reflux condenser, and the products is provided in an induced-draft water-cooling tower in which the two fans are driven by two-speed electric motors.

Water in this tower is acid treated and since the success of acid treatment depends on close control of the pH, a pH recorder and a controllable acid feed pump have been provided. This enables the operator to tell at a glance what the pH is and to easily make required adjustments in the acid feed rate.

BOOKS

OKLAHOMA GEOPHYSICAL PROSPECTS, 1954 edition. Published by Research Oil Reports, 28 Northwest First Street, Oklahoma City. Compiled by Jack Kessler. $40 to subscribers, $50 to nonsubscribers of Research Oil Report.

This is a roundup of geophysical prospects in 30 counties throughout Oklahoma, some drilled and some undrilled. It is comprehensive, detailed, and impressive. Each prospect is outlined on an individual area plat and any drilling which has occurred upon it is indicated. An accompanying discussion of each area outlines any exploration that has taken place, both by geophysical operation and by drilling. Lease holders on and around the prospect are listed, and interesting sidelights on indications of production are outlined in detail. A total of 150 individual prospects is included in this volume.

OIL DIPLOMACY. By Nasrollah S. Fatemi. Published by Whittier Books, Inc., New York 10. 405 pp., $4.50.

Subtitled "Powderkeg in Iran," this book is an analysis of oil diplomacy in Iran from the granting of the first oil concession in 1901 to the nationalization act in 1951. It covers the founding of Anglo-Iranian Oil Co., the unsuccessful attempts by United States nationals and the Russian government to obtain oil concessions, and the post-World War II diplomacy that narrowly averted the fall of Iran to the Soviet bloc.

Much of the book's value to American oil men lies in its insight into the attitude of the Iranian people themselves toward foreign development of their oil resources. The author, a brilliant young Iranian scholar, presents his peoples' point of view objectively and clearly. He tells why American attempts to gain concessions were repeatedly denied, and how bitterly the Iranian Parliament fought to prevent Russian acquisition of important oil rights. Those in the oil industry who want to increase their understanding of Iran's role in oil diplomacy will find this very helpful reading.

A.S.T.M. STANDARDS IN ADHESIVES, September 1954 edition. Published by the American Society for Testing Materials, 1916 Race Street, Philadelphia 3. 216 pp., $1.75.

This edition includes 42 A.S.T.M. standards in their latest form, including 34 test methods, 4 recommended practices, 3 definitions, and 1 specification—the complete range of current A.S.T.M. standards relating to adhesives. The standards cover adhesives, rubber cements, brake-shoe adhesives and vulcanized rubber, electrical insulation, and other miscellaneous items. A high percentage of the material included in earlier editions has been revised. Of the 28 new methods presented, 12 have been developed by the A.S.T.M. Committee D-14 on adhesives, while the remaining 16 standards allied to the adhesives field have been prepared by other A.S.T.M. committees.

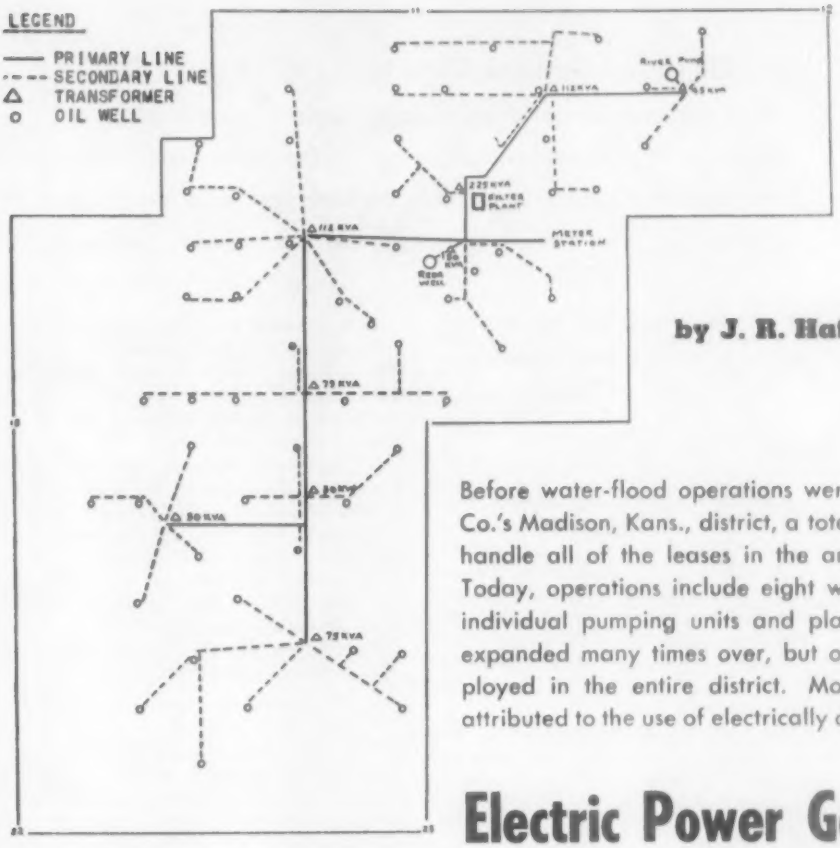


Fig. 1—The Madison block, which is developed on 20-acre spacing. Total electrification cost with this system was $84,028.

by J. R. Hatfield and Frank Beach

Before water-flood operations were started in Cities Service Oil Co.'s Madison, Kans., district, a total of 75 men were employed to handle all of the leases in the area under stripper operations. Today, operations include eight water-flood projects, with more individual pumping units and plants to operate. Production is expanded many times over, but only 60 men are presently employed in the entire district. Most of this savings in labor is attributed to the use of electrically operated equipment.

Electric Power Gets Nod In Cities Service Water-Flooding Projects

WHEN Cities Service Oil Co. began operations in 1936, its first three projects were operated with gas engines. It was soon found that the maintenance and operational labor required severely taxed the available man power. Wintertime operations were especially difficult due to cooling system maintenance and ignition troubles with gas engines.

After the three initial projects, all subsequent water floods have been equipped with electrically powered units. At the present, Cities Service has 16 water-flood projects using 476 electric-motor-driven units with a total installed horsepower of 8,476.

To consider the economic aspects of using electric power for water flooding, perhaps the best illustration is an actual water-flood project that has been equipped for electrical operation. The Madison block in Greenwood County, Kansas, contains 985 acres and 101 wells; and it has run the full gamut of primary production, gas repressuring, and finally water flooding.

Authors are with Cities Service Oil Co., Bartlesville, Okla. Paper presented at 1954 A.I.E.E. Petroleum-Electric Conference, Tulsa.

Early primary production was pumped by large standard units. As production decreased, the standard end units were removed, and jacks and central powers were installed to pump the wells. Finally, as the water-flood development again increased production in excess of the capacity of the jacks, modern pumping units were installed to handle the larger volumes of fluid.

In 1948, the decision was made to convert Madison field to a water-flood project. It was realized that the development of this field as a water-flood project would require almost a complete replacement of all surface and pumping equipment in order to treat and handle the large volumes of injected and produced fluids. Oil wells which were being pumped with jacks and central powers would be replaced with modern pumping units. Water-supply sources would be developed and equipped to handle large volumes of fluids for injection. And filter plants and pumps would be installed to treat and pump the injection water.

One of the first things that had to be considered was the kind of energy to be used for power. Although Madison field was under gas repressuring, it was realized that the produced gas would diminish quickly when water flooding was started. A preliminary economic study was made which indicated that electrical operation would compare favorably with any other method of operation. Some of the factors that influenced the decision to use electric energy for water flooding were:

1. Electric power was readily available on the lease.
2. Power rates were favorable.
3. Electric prime movers were less than half the cost of internal-combustion engines.
4. Electric motors were more adaptable to automatic operation and free wheeling.
5. Some 25 to 35 per cent less labor was needed for operation than with gas engines.
6. Ninety-five per cent was saved in

maintenance labor over gas engines.

7. Smoother application of power was expected for increased life of equipment.

On two similar water-flood leases, Cities Service found that the cost of handling fluid is approximately twice as much on the lease using gas as on the lease using electricity. Availability and price of both gas and electricity will affect the choice between the two power sources.

Field Application of Electric Power

The Madison block pilot flood was started with five input wells in December 1948, with input water produced and pumped by gas-operated engines. The flood was gradually expanded until 1951 when many of the oil wells were producing beyond the capacity of the jacks and central powers. In December 1951, the first stage of the electric system was installed.

Electricity was purchased on the lease at a primary voltage of 12,400 volts. Primary lines were constructed to various points on the lease where transformers reduced the voltage to 440 volts for secondary transmission. As the flood progressed, additional electric lines were installed until the whole block was under electric operation (Fig. 1). The electric motors required to power the various water-flood equipment are as follows:

(a) Three 60-hp. motors to power high-pressure pumps in the filter plant.

(b) One 7½-hp. motor for backwash pump.

(c) One 25-hp. motor to power the turbine-type pump on the river.

(d) One 135-hp. motor to power the Reda deep-well pump.

(e) One 7½-hp. motor to power a SWD pump.

(f) One 7½-hp. motor to power a fresh-water-supply pump.

(g) Forty-nine 10-hp. motors to power oil-well pumping unit.

(h) Thirteen 10-hp. motors to power oil-well pumping units yet to be installed.

A total of 70 electrical units with a combined horsepower of 982½ will ultimately be required to handle the water-flood requirements of Madison block.

Investment costs . . . The electrical investment costs for Madison field may be divided into two parts: the investment required for transmission lines, and the investment required for prime movers. The cost of the entire field-transmission system including poles, wire, transformers, and capacitors was $39,074. The investment for prime movers including switch boxes, wiring, and installation labor is:

(a) Three 60-hp. motors for hp. pumps	$4,400
(b) One 7½-hp. motor for backwash pump	330
(c) One 25-hp. vertical motor for turbine pump	760
(d) One 7½-hp. motor for fresh water supply	330
(e) One 7½-hp. motor for salt-water disposal	330
(f) Forty-nine 10-hp. oil-well pumping-unit motors	22,148
(g) Thirteen 10-hp. oil-well units to be installed	6,656
(h) One 135-hp. Reda pump installation	10,000
Total est. cost for prime movers	$44,954
Total electrification cost	$84,028

The cost of electrification of any water-flood project will depend upon the spacing, depth of the producing sand, and thickness of the sand. Madison field is developed on a 20-acre water-flood spacing. Had the spacing been 10 acres, there would have been twice as many input wells and twice as many oil wells to pump. The input-water requirements would also have been twice as great.

For the condition peculiar to the Madison field, the cost per acre for electric installation is:

Total developed acres	985
Cost per acre for transmission system	$39.67
Cost per acre for prime movers	45.63
Total electrification cost per acre	$85.30
Total ultimate installed horsepower	982½
Cost per installed horsepower	$85.22
Total daily theoretical fluid capacity, bbl.	75,056
Cost per barrel of capacity	$1.12
Total number of oil wells	62
Cost per oil well	$1,355

Power Costs in Relation to Volume of Fluid

A summary of electric power costs on the Madison water flood by years is as follows:

Year	Kw.-hr.	P.F. (%)	Demand	Total bill	Avg. cost/ kw.-hr.
1951	419,200	55	62-93	5,516	0.013
1952	1,190,400	71	154-214	12,868	0.011
1953	2,541,200	77	345-449	25,653	0.010
1954*	1,141,600	83	414-483	11,141	0.010

*Four months.

The total fluid handled by all electric units with number of barrels handled per kilowatt-hour and the cost per barrel is compared as follows:

Year	Bbl. total fluid	Bbl./ kw.-hr.	Cost/ bbl.
1951	2,846,087	6.8	$0.0019
1952	5,373,142	4.5	0.0024
1953	8,176,912	3.2	0.0031
1954*	2,986,277	2.6	0.0037

*Four months.

It is apparent that the fluid handled per kilowatt-hour has become less, and the cost per barrel of fluid handled has become higher. At the same time, the power factor has improved and the demand has become less.

It is evident that the case of the increased cost is due to the increasing number of pumping units installed over the period. Inspection of the installed horsepower hours in relation to the fluid handled indicates that the pumping units are far less efficient than other methods of pumping fluids.

The reason for the inefficiency of oil-well pumping units are:

1. Fluctuating load conditions.
2. High fluid heads.
3. Friction lost in long rod strings.
4. Volume pumped limited to capacity of well to produce and not the pumping equipment.
5. Gas conditions in the well.

Installed vs. required power . . . The low volume of fluid handled in relation to installed horsepower on pumping units suggests that perhaps the motors are too large for the volume of fluid being pumped.

A 10-hp. motor should have the capacity to produce about 300 bbl. of fluid per day from 1,900 ft. However, the average fluid pumped from Madison Unit wells is only 102 bbl. per day per well. To pump 102 bbl. of fluid would require only a 5-hp. motor. However, it is possible that many of the wells might increase in production to a point where the 10-hp. motors are needed.

A survey of the Madison Unit oil wells as of January 1, 1954, indicated that out of a total of 49 oil wells equipped with 10-hp. motors, only 3 wells required 10-hp. motors to pump the fluid being produced. Twenty-four wells could use a 5-hp. motor, 15 wells could use a 3-hp. motor and 7 wells could use a 7½-hp. motor.

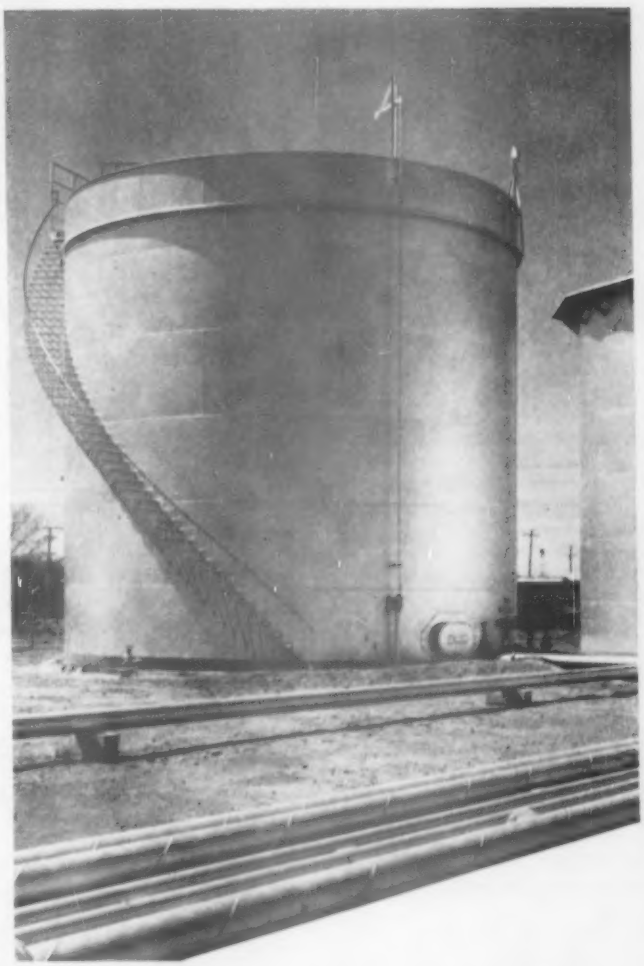
Out of a total of 490 installed horsepower, only 254 hp. is actually needed to produce the present capacity of the wells. As of December 1953, the following comparison is made between the various pumping methods in relation to the horsepower hours and barrels of fluid handled per day.

Storing "Black Gold" near Sutter's Fort

The gold seekers of 1849 and 1850 who reached the site of Sutter's Fort, now the City of Sacramento, California, never dreamed that "black gold" would be more important to the area than the type that glitters. Such is the case though, for without petroleum products the wheels of civilization would soon stop turning.

The structure shown at the right is a 6,500-bbl. tank, 36-ft. in diam. by 36-ft. high, equipped with a Horton® Double-Deck Floating Roof. It is located at the General Petroleum Company's terminal in Sacramento, California, where gasoline, diesel fuel, fuel oil, automotive oils and lubricants are stored for delivery throughout the area.

Horton Floating Roofs reduce evaporation loss, decrease corrosion and eliminate fire hazard from stored volatile liquids. Built in three types—Double-Deck, Pontoon and Pan—all three are equipped with the Horton Seal to close the space between the tank shell and the edge of the roof. Further information and assistance in selecting the proper Horton Floating Roof can be obtained by writing our nearest office.



6,500-barrel tank equipped with Horton Double-Deck Floating Roof. The tank is 36-ft. in diam. by 36-ft. high.

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Cleveland, 15.....2204 Midland Bldg.
Detroit, 26.....1514 Lafayette Bldg.
Houston, 2.....2119 C & I Life Bldg.
Los Angeles, 17...1523 General Petroleum Bldg.
New York, 6.....3347—165 Broadway Bldg.
Philadelphia, 3...1615—1700 Walnut Street Bldg.
Pittsburgh, 19.....3228 Alcoa Bldg.
Salt Lake City, 4.....525 West 17th South St.
San Francisco, 4.....1554—200 Bush St.
Seattle, 1.....1325 Henry Bldg.
Tulsa, 3.....1606 Hunt Bldg.

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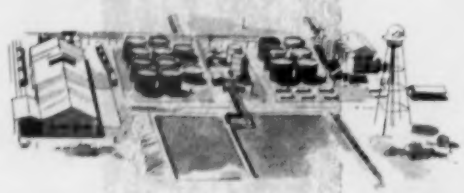
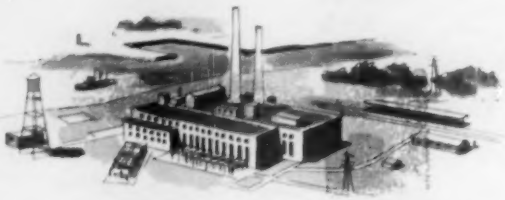


PETRO-CHEMICAL PLANT in Texas to produce ethylene from natural gas by the owner's process.



GENERATING PLANT, one of three of 66,000 KW each, installed for electric utility company in Southwest.

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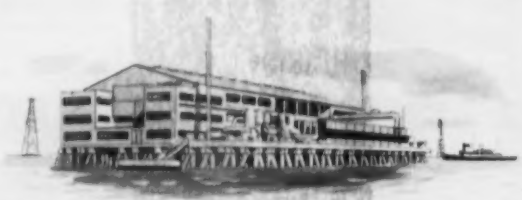

PRESSURE MAINTENANCE plant for Venezuelan gas reservoir built in 62 ft. of water with 50,000 h.p.

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Kind of unit—	Units and hp.	Daily hp. hours	Per cent of total	Daily fluid handled		Fluid pumped per hp. hour	Fluid head, lb.
				Bbl.	Per cent		
Oil wells	49 by 10 hp.	8,760	55.0	4,441	12.5	0.51	870
High-pressure pumps	3 by 60 hp.	3,220	20.2	11,769	33.2	3.65	550
Reda pump	1 by 135 hp.	3,240	20.3	8,531	24.1	2.63	695
River pump	1 by 25 hp.	600	3.8	10,000	28.2	16.67	100
Backwash pump	1 by 7½ hp.	4	0.1	300	0.8	75.00	45
Salt-water disposal pump	1 by 7½ hp.	53	0.3	200	0.6	3.78	100
Fresh-water pump	1 by 7½ hp.	53	0.3	200	0.6	3.78	100
Total	852	15,830	100.0	35,441	100.0	2.22	

It is evident from the above tabulation that the oil-well units require 55 per cent of the total horsepower hours to pump only 12 per cent of the total daily fluid handled. Since there is more horsepower installed to power pumping units than for any other method of pumping, it is evident why the volume of fluid pumped per kilowatt-hour has decreased since 1951.

The schedule of horsepower installation by years is as follows:

Date	Pumping units	High-pressure pumps	Backwash	River pump	House water	Reda	Total
1951	86	120	7½	25	0	0	238½
1952	250	120	7½	25	0	0	402½
1953	367	180	7½	25	7½	105	699
1954*	490	180	7½	25	7½	135	852

*Four months.

Cost of Electrical Operation in Relation to Gas Operation

While it is not possible to make a comparison of the costs of operation between gas and electricity in Madison field, a comparison can be made between Madison field, which is operated with electricity, and the Patterson block, which is operated entirely with gas engines. The Patterson block is a water-flood project of 200 acres producing from the same horizon and about the same depth (1,800 ft.). Equipment investment cannot be compared because much of the equipment used on the Patterson block was second-hand when installed. Also, the gas fuel lines were already in place as gas-gathering lines.

The energy costs can be compared as follows:

On these specific leases, with gas at 24.5 cents per M.c.f., electricity costs only about half as much to handle an equal volume of fluid. It must be remembered that conditions, while similar, are not identical.

Maintenance costs . . . The major maintenance cost of electrical operation is due to motor burnouts caused by electrical storms. A comparison for the year 1953 between the Madison motor-repair costs and the Patterson engine-maintenance costs are as follows:

Madison	*$707	42 units	All motors in field and plant
Patterson	1,006	29 units	Field engines (16 hp., single cylinder)
	3,523	4 units	Plant engines (40 hp., three cylinder)
Total	$4,529		

*Labor and material.

The above comparisons are indicative but not conclusive and are intended to show, only in this specific case, a comparison between gas-engine and electrical-motor maintenance costs.

MADISON BLOCK ELECTRIC POWER COST SCHEDULE

Demand:	
First 175 kva.	$1.40 per kva.
Next 425 kva.	1.10 per kva.
Excess kva.	.90 per kva.
Energy:	
First 50 kw.-hr.	$0.012 per kw.-hr.
Next 100 kw.-hr.	0.0085 per kw.-hr.
Next 250 kw.-hr.	0.0065 per kw.-hr.
Excess	0.0055 per kw.-hr.

Minimum charge, 50 per cent of 250 kva. Three-phase, a.c., 60 cycles, 12,470 volts.

COST OF GAS VS. COST OF ELECTRICITY

Year	Fluid handled, bbl.	Fuel cost	Cost per bbl.	Electricity cost/bbl.
1951	4,085,724	$15,506*	$0.0038	$0.0019
1952	3,140,222	14,398	0.0046	0.0024
1953	2,468,522	16,555	0.0067	0.0031

*Average cost per M.c.f. of gas = 24.5 cents.

Time-Cycle Balance of Pumping Wells

By Rex N. Brown

THE operator who carries on a properly planned time-cycle schedule for his individual pumping wells, benefits in increased production, reduced power operating cost, and lower maintenance costs.

The following is a case where increased production was immediately apparent; it was conducted with a graphic wattmeter on the electric motor on a well in Cedar Lake field, Texas. The pump was set at 4,867 ft. and was using a 15-hp. motor with a 34-in. stroke at 20 s.p.m. As is normal practice, the test was kicked off by checking the well under existing operating conditions. Under this condition of operating around the clock the fluid pumped amounted to 31 bbl. with an energy use of 90 kw.-hr. This means an energy cost of 3.89 cents per barrel or $1.24 per day to operate this well.

The next time setting was 5 hours on and 7 hours off. This means 10 hours pumping time per day as compared to the original 24. The well produced 34 bbl. of fluid with the use of only 46.5 kw.-hr. This is an increase of 3 bbl. of fluid over the original operation and the energy used cut almost in half.

Even with this improved operation, the charts indicated that the well had begun to pump off after about 2 hours. This was verified by the production charts so on the following test a time setting of 2 hours on and 4 hours off was used.

As expected, there was additional improvement. In this case, 38 bbl. of fluid was produced at a cost fo 1.375 cents per barrel.

The time was left at 2 hours on but the off time was reduced to 2 hours for the next time setting. The production was increased again and was now at a rate of 44 bbl. per day. During this 24-hour period energy was used at the rate of 1.09 kw.-hr. per barrel. Production was at a rate of 3.66 bbl. per hour.

Because of this, the pumping time the following day was reduced to 1½ hours on and increased the down time to 2½ hours. The result of this test was an increase in the cost per barrel as well as a decreased production. For a production of 35 bbl. the energy cost was 2.18 cents per barrel. The daily cost of energy for well operation was $.545.

Author is with Southwestern Public Service Co., Lubbock, Tex. Paper presented at 1954 conference of Petroleum Electric Power Association, New Orleans.

SEPARATION PLANT is at left and compression plant is at right at Renwar Oil Corp.'s installations on Mustang Island, South Texas.

Here's a resume of unusual features at

Renwar's New Island Processing Plant

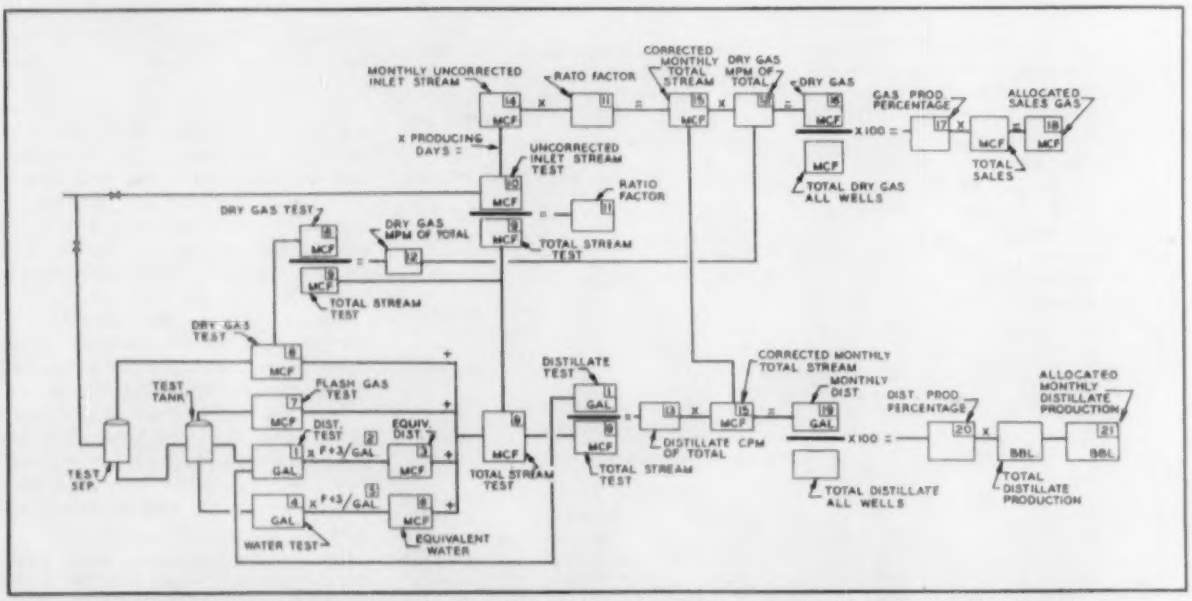
1. It processes 30 M.M.c.f.d. of wet gas from offshore wells.
2. It uses untreated salt water for plant cooling.
3. It's set on a 6-ft.-high fill-in to protect it from the sea.

by F. Lawrence Resen
Gulf Coast District Editor

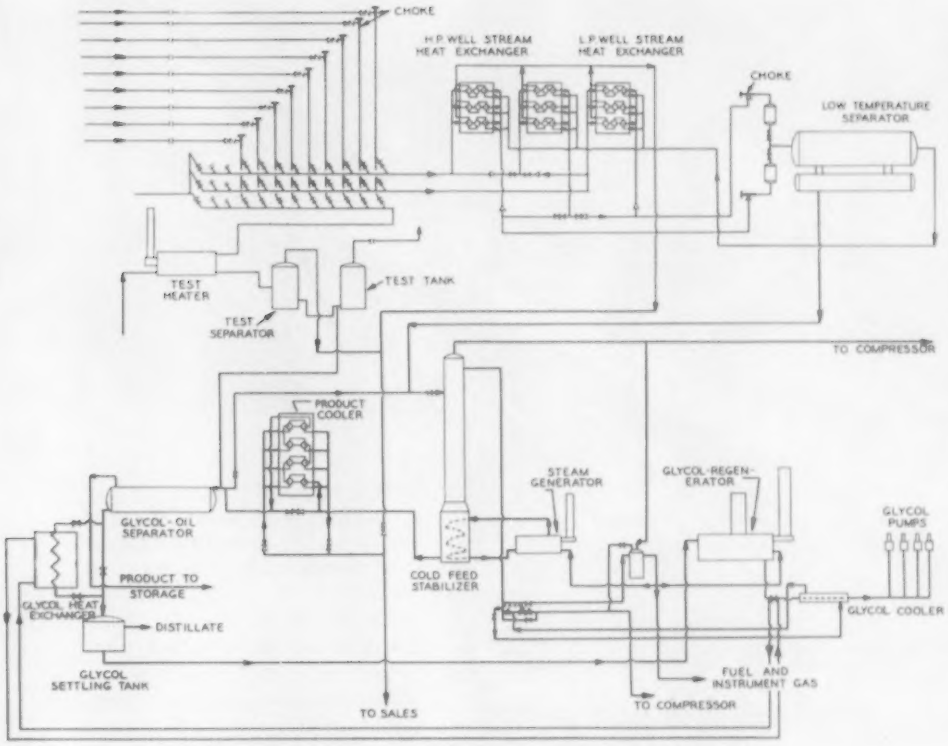
RENWAR OIL CORP.'S installations on Mustang Island, South Texas, present an interesting study in field processing, test procedures for allocation purposes, and plant construction.

Located on this narrow island, which closes off Corpus Christi Bay from the Gulf of Mexico, are a 50-M.M.c.f. low-temperature separation plant and a compression plant which are used to serve various wells in nearby Mustang Island and Redfish Bay fields.

The separation unit picks up approximately 30 million cubic feet of wet



GAS AND LIQUID allocation scheme for the plant. Numbers in squares correspond with number headings in Table 1.



SCHEMATIC FLOW DIAGRAM for Renwar's Mustang Island plant.

gas per day from eight wells, removes and stabilizes the distillate content, permitting residue gas to enter a transmission system. The compression unit meanwhile picks up about 5 million cubic feet per day of casing-head gas from oil wells in the area and compresses it to pipeline pressure.

Feature of the operations include: (1) Recovery of considerable more distillate from the wet gas over conventional methods; (2) use of a test separator and tank for determining allocation of incoming streams according to content of dry gas, flash gas, distillate and water; (3) construction problems faced in locating plant site on a wind-swept beach.

The testing and allocation procedures are of special interest.

Process flow . . . Six of the eight well streams entering the plant are from wells in Redfish Bay-Mustang Island No. 10 sand, and the other two are producing from the Mustang Island No. 5 sand. Each of the six wells which are located in the bay has a platform containing a water knockout drum, glycol injection pump, and glycol storage tank. The two wells on land only have the water knockouts. These operate at full well pressure—varying from 2,300-2,800 psi.—and serve to knock out all free water in the well stream.

During winter when the temperature of the bay water is below 68°, hydrates start forming on the offshore wells. To offset this, gas-driven pumps are used to inject glycol in the gas stream downstream of the water knockout to prevent freezing in the flow lines which are laid about 2 ft. beneath the bay bottom.

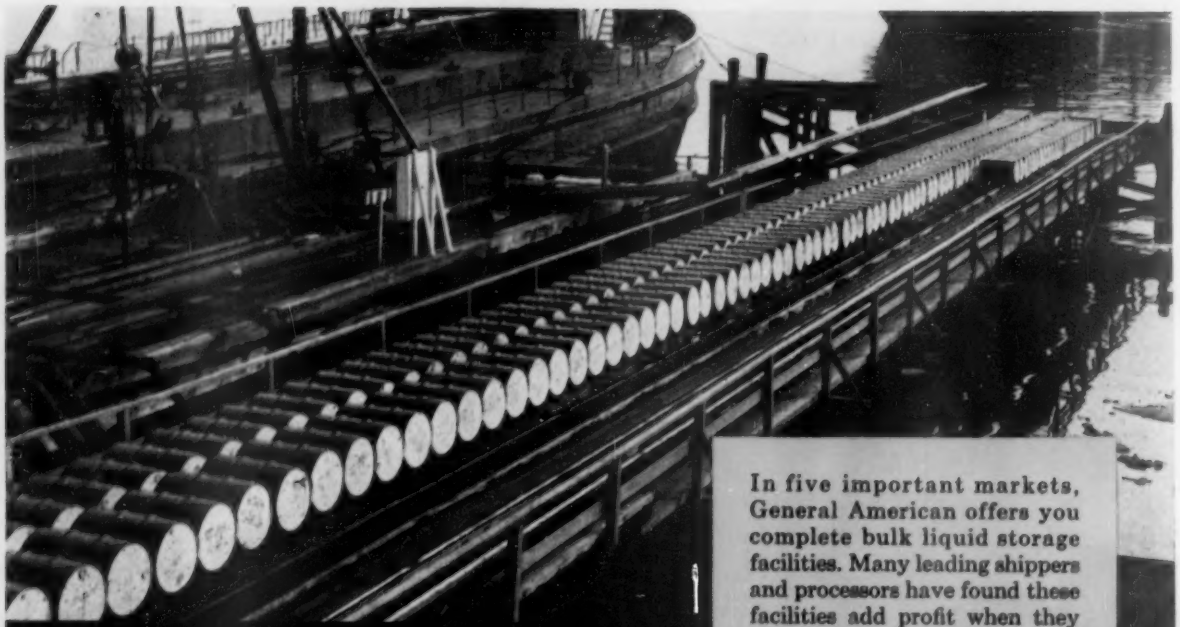
The individual well streams enter the plant through high-pressure meter runs, operating at line pressures (well pressure less pressure drop in gathering lines), and then enter one of two headers. These headers operate at about 1,800 and 2,200 psi., respectively, and the individual streams are choked slightly to bring their pressures into conformance with the particular header they enter. To offset freezing due to these pressure drops, glycol is injected into both low-pressure and high-pressure headers.

Gas from the two headers passes through heat exchangers where it is cooled by outgoing sales gas. From here the two inlet-gas carriers terminate in two hydrate accumulators after first passing through two automatic back-pressure reducing valves. It is at these valves where the gas pressure is reduced to the sales line pressure of about 800 psi. This appreciable pressure drop is responsible for the minus 10° F. temperature experienced in the low-temperature separator which receives the combined stream from the hydrate accumulators.

The gas stream from the separator is dehydrated gas, which after exchange with the incoming stream enters the United Gas Pipe Line Co. tie-in at the plant. The liquid stream from the separator contains distillate, glycol, and water which are separated in further processing. An idea of the effectiveness of the distillate recovery from the well stream may be seen by the average 26 bbl. recovered per M.M.-c.f. of wet gas by low-temperature separation as compared to an average of 16 bbl. recovered by conventional separation. The entire liquid stream is charged to stabilizer where a temperature of 200° F. is maintained on the bottom of the tower by means of a steam-generator feeding the heating coils on a thermal-siphon arrangement with no forced circulation of steam. The stabilizer operates at about 40-lb. pressure and serves to provide the 54.7° A.P.I. gravity distillate with a 20-lb. R.v.p. Some low-pressure gas is pulled off the top of the stabilizer and part of this is used for fuel, while the remainder is charged to the compression plant for recompression.

Modification . . . Stabilized liquid is then dumped into the glycol-oil separator from where distillate is pulled off the mixture and charged to product storage tanks. The glycol-water mixture passes to the regenerator system for removal of water. A modification was effected at this point by the inclusion of a settling tank in between the glycol-oil separator and glycol regenerator. In operating the system previously, it was apparent that the regenerator was not functioning properly due to excessive vaporization and it was felt that some distillate was being carried over into the regenerator. By providing holdup period, additional distillate is removed in the settling tank, with a subsequent improvement in the operation of the regenerator.

The regenerator is held at a temperature of 250° F., and as the glycol-water mixture passes through it, the water is flashed to steam with a re-



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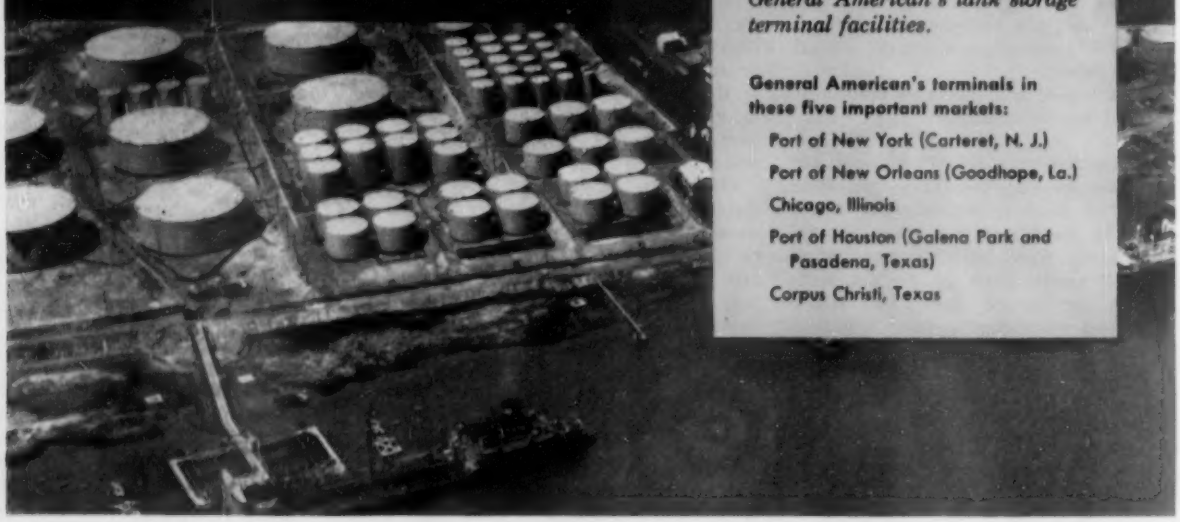

sultant concentration of the glycol, which is then cooled and picked up by glycol pumps for reinjection into the headers.

Test units . . . The allocation of gas and distillate processed at the plant is made on the basis of monthly test runs through a conventional separator and measuring tank. An additional header is provided for this purpose so that any well stream may be diverted for test purposes. A test stream is first heated before entering the high-pressure separator so that a 90° F. temperature will be maintained within the vessel. A choke drops the incoming pressure into the test heater down so that 990 psi. is held on the test separator.

Liquid from the separator is dumped into a pressure test tank at 35 psi. where the contents are measured on calibrated gage glasses. Overhead gas from the separator and flash gas from the test tank are metered, with the former stream reentering the main system and the latter stream going to fuel.

Test calculations . . . In making the computations, the first step is to convert the gallons of distillate and the gallons of water recovered in the test tank into equivalent cubic feet volumes by applying the proper conversion factors. The volume of metered separator gas and volume of metered test tank flash gas are corrected to compensate for various deviations from standard conditions and the four volumes totaled to arrive at the "Total Stream Test" in M.c.f. While the test is under way, the volume of gas metered on the inlet line to the plant is taken as the "Uncorrected Inlet-Stream Test" in M.c.f. These two quantities are used to determine a "Ratio Factor" to be used to correct for variables in the inlet stream. This ratio is achieved by dividing the total stream test by the uncorrected test volume.

The monthly uncorrected inlet stream volume is obtained from the inlet meter and this figure multiplied by the ratio factor determines the corrected monthly total stream in M.c.f. Another ratio is obtained by dividing the M.c.f. of the dry gas obtained from the separator test run, by the total stream test, and this ratio, which represents the ratio of dry gas in the well stream, is multiplied by the corrected monthly total stream to give the actual cubic feet of dry gas. This figure is divided by the total cubic feet of dry gas handled by the plant from all wells to give the gas production percentage of the well, and this percentage is used against the total cubic feet of sales to allocate the sales gas per well.

In determining the liquid allocation, a similar set of computations is made. Initially, the gallonage obtained on the distillate recovered in the test tank is divided by the total stream test to obtain a g.p.m. on the well stream, and this is multiplied by the corrected monthly total stream to provide a monthly gallonage of distillate. An allocation percentage is obtained for the well by dividing this figure by the total distillate production of all the wells, and this percentage is used to allocate the monthly production and sale of products.

For example . . . A typical computation will serve as an illustration of the procedure described above. On a distillate test, 1,012 gal. was obtained at 60° F. (1).* The conversion factor for this particular stream was determined to be 19.12 cu. ft. per gal. (2), and hence the equivalent distillate was equal to 19.35 M.c.f. (3). The water recovered in the test run was 5 gal. (4), and the standard conversion factor of 175.4 cu. ft. per gal. (5), was used to obtain the equivalent water content of 0.88 M.c.f. (6). The flash gas-test (7), and dry-gas test (8), were volumes recorded as 18.75 and 1,515.18 M.c.f., respectively.

By addition of the above four volumes, the total stream test (9) is computed as 1,554.16 M.c.f. Meanwhile, the uncorrected inlet stream (10) has been metered on the test run and is listed as 1,429.70 M.c.f. Dividing the latter into the former results in a Ratio Factor (11) of 1.08705.

The monthly uncorrected inlet stream of 114,300 M.c.f. (14), is obtained from the recorder, and this figure is multiplied by the ratio factor to obtain a corrected monthly total stream of 124,250 M.c.f. (15). A dry-gas moles per mole (m.p.m.) of the total, 0.97492 (12), is obtained by dividing the dry-gas test, 1,515.18, by the total stream test, 1,554.16. This ratio multiplied by the corrected monthly total stream results in a dry gas

*Numbers in parentheses refer to columns in tabulation in Table 1. The figures relate to first well listed. It might also be noted at this point that due to proration schedules the plant was receiving considerably less than the average 30 M.M.c.f. usually processed each day.

TABLE 1—GAS AND LIQUID ALLOCATION

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Well	Dist. test, gal. at 60°	Dist., cu. ft. per gal.	Equivalent dist., M.c.f. 1 × 2	Water test, gal.	Water, cu. ft. per gal.	Equivalent water, M.c.f. 4 × 5	Flash gas-test, M.c.f.	Dry gas-test, M.c.f.	Total stream test, M.c.f.	Uncorrected inlet-stream test, M.c.f.	Ratio factor 9 ÷ 10	Dry gas m.p.m. of total 8 ÷ 9
"A"	1,012	19.12	19.35	5	175.4	0.88	18.75	1,515.18	1,554.16	1,429.70	1.08705	.97492
"B"	915	18.11	16.57	1	175.4	0.18	8.78	673.72	699.25	658.09	1.06254	.96349
"C"	1,004	18.93	19.01	3	175.4	0.53	8.16	1,622.15	1,649.85	1,477.49	1.11666	.98321
"D"	904	18.61	16.82	6	175.4	1.05	8.79	1,399.52	1,426.18	1,323.24	1.07779	.98131
"E"	1,020	18.75	19.13	14	175.4	2.46	10.48	1,592.89	1,624.96	1,472.45	1.10358	.98026
"F"	904	19.55	17.67	8	175.4	1.40	9.85	1,404.98	1,433.90	1,227.45	1.16819	.97983
"G"	890	19.07	16.97	21	175.4	3.68	9.31	1,372.10	1,402.06	1,304.87	1.07448	.97863
"H"	1,048	19.12	20.04	10	175.4	1.75	12.14	1,523.84	1,557.77	1,464.56	1.06364	.97822

	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Well	Dist., g.p.m. of total, 1 ÷ 9	Monthly uncorrected inlet-stream, M.c.f.	Corrected monthly total stream, M.c.f., 14 × 11	Dry gas, M.c.f., 15 × 12	Gas prod. percentage, 16 ÷ total 16	Allocated sales, gas, M.c.f., total sales × 17	Monthly dist., gal., 15 × 13	Dist. prod. percentage, 19 ÷ total 19	Allocated Mo. dist. prod., bbl. Total 21×20	Allocated Mo. dist. sales, bbl.
"A"	.65116	114,300	124,250	121,134	17.59219	108,169	80,907	15.74520	2,730.79	2,645.44
"B"	1.30854	89,127	94,701	91,243	13.25114	81,478	123,920	24.11589	4,182.58	4,051.26
"C"	.60854	44,615	49,820	48,984	7.11391	43,741	30,317	5.89995	1,023.27	1,003.41
"D"	.63386	21,369	23,031	22,601	3.28232	20,182	14,598	2.84090	492.72	483.94
"E"	.62771	111,883	123,472	121,035	17.57781	108,081	77,505	15.08314	2,615.97	2,530.76
"F"	.63045	92,296	107,819	105,644	15.34259	94,337	67,974	13.22832	2,294.27	2,227.73
"G"	.63478	90,870	97,638	95,551	13.87679	85,324	61,979	12.06164	2,091.93	2,028.76
"H"	.67276	79,171	84,209	82,375	11.96325	73,559	56,652	11.02496	1,912.13	1,865.22
Total		643,631	704,940	688,567	100.00000	614,871	513,852	100.00000	17,343.66	16,836.52

This 20-inch diameter Armco Welded Steel Pipe is being installed as line pipe for gas transmission by the El Paso Natural Gas Company, San Juan Basin, Farmington, New Mexico.

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And with the 20 diameters available with Armco Welded Pipe—6 to 36 inches—it's easy to select the right diameter for your needs. You won't have to buy more capacity than the installation warrants.

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Use Armco Welded Steel Pipe for requirements in the Natural Gasoline and Natural Gas Divisions and wherever else you need dependable line pipe. Write for data. Armco Drainage & Metal Products, Inc., Welded Pipe Sales Division, 3855 Curtis St., Middletown, Ohio. 201 KOME Building, Tulsa, Oklahoma. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

ARMCO WELDED STEEL PIPE

ARMCO

COLD-FEED STABILIZER is heated by thermal-siphon arrangement with steam boiler located at its left.

SCRUBBERS FOR COMPRESSION PLANT are in foreground, with compressor building in rear. Above-ground headers are virtually eliminated to reduce corrosion.

M.c.f. total of 121,134 M.c.f. (16). The summation of column 16 represents the total dry gas entering the plant, and this is divided into the individual well output to arrive at the gas production percentage of 17.59219 (17). The total sales of gas are multiplied by the individual well percentage to give the allocated sales gas figure of 108,189 M.c.f. (18).

In the distillate allocation, the distillate test gallonage of 1,012 is divided by the total stream test of 1,554.16 M.c.f. to give a g.p.m. of 0.65116 (13). The monthly distillate for the well stream 80,907 gal. (19), is obtained by multiplying the corrected monthly total stream by the g.p.m. A percentage figure of 15.74520 (20) is obtained by dividing the individual well output by the total production. The allocated monthly production in barrels, 2,730.79 (21) is obtained by multiplying the production percentage by the total plant production, while the allocated monthly distillate sales is obtained by balancing opening stock, production and closing stock, to arrive at 2,645.44 (22).

The above manner of testing and computing the incoming streams to the plant is felt to provide an accurate, adequate and equitable means of allocating individual well production. A cross-check is made as a routine check between the actual sales gas and the corrected monthly total wet stream, with the differences running as low as 1 per cent, with the average slightly higher.

Compression plant . . . In addition to the separation facilities, a compression plant including two 440-hp. gas-engine compressors is located at this site. Purpose of the plant is to pick up all casing-head gas in the area together with flash gas from the high pressure plant and bring it up to pipeline pressure. Ordinarily, the plant handles about 5 M.M.c.f. per day with a 5½-6 M.M.c.f. capacity available.

The plant is fairly straightforward, with incoming gas passing through meter runs for allocation purposes, and then entering a scrubber before being picked up by the first stage suction. Scrubbing and cooling are effected between stages, with a final pass through a discharge scrubber following the third stage.

An interesting feature here is the atmospheric cooling tower which uses salt water for cooling both the interstage gas flow and the closed circuit jacket cooling water. A suction pit has been dug on the bay side of the location and two sea water pumps used to pick up the salt water for spraying over the cooling tower. The water goes through the tower on one pass and is discharged some distance from the suction pit. The use of the bay waters simplified the cooling problem, although impellers on pumps last only 6 months and then have to be replaced.

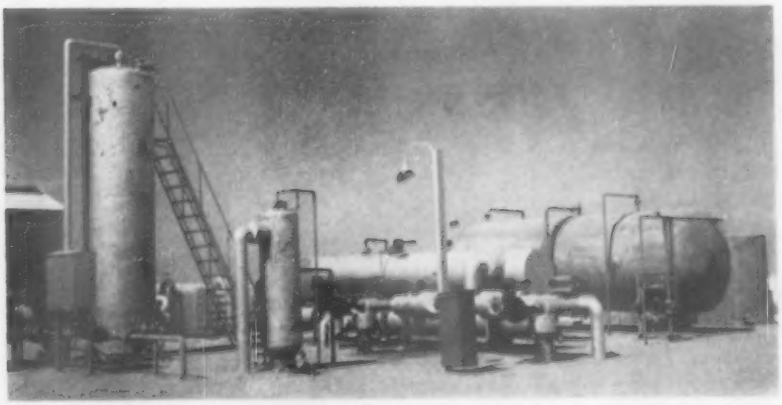
Construction . . . Due to the shifting sands on the island location, considerable attention had to be paid to constructing a plant site. Instead of digging down, the plant foundation consists of a synthetic mound, surrounded with sheet piling, held in place by 1½-in. tie rods. The sheet piling was erected on a 100-ft. radius, and then the enclosure thus formed was filled with sand, topped with shell, and finally black-topped, with the equipment and units erected on this base. Thus, the plant site occupies an area some 6 ft. higher than the surrounding sand.

To offset the severe corrosive and erosive atmosphere, all exposed equipment was provided with a Dimetco coating. This serves to protect the metal surfaces from the direct effects of wind-driven sand and salt spray which would attack a normal paint job.

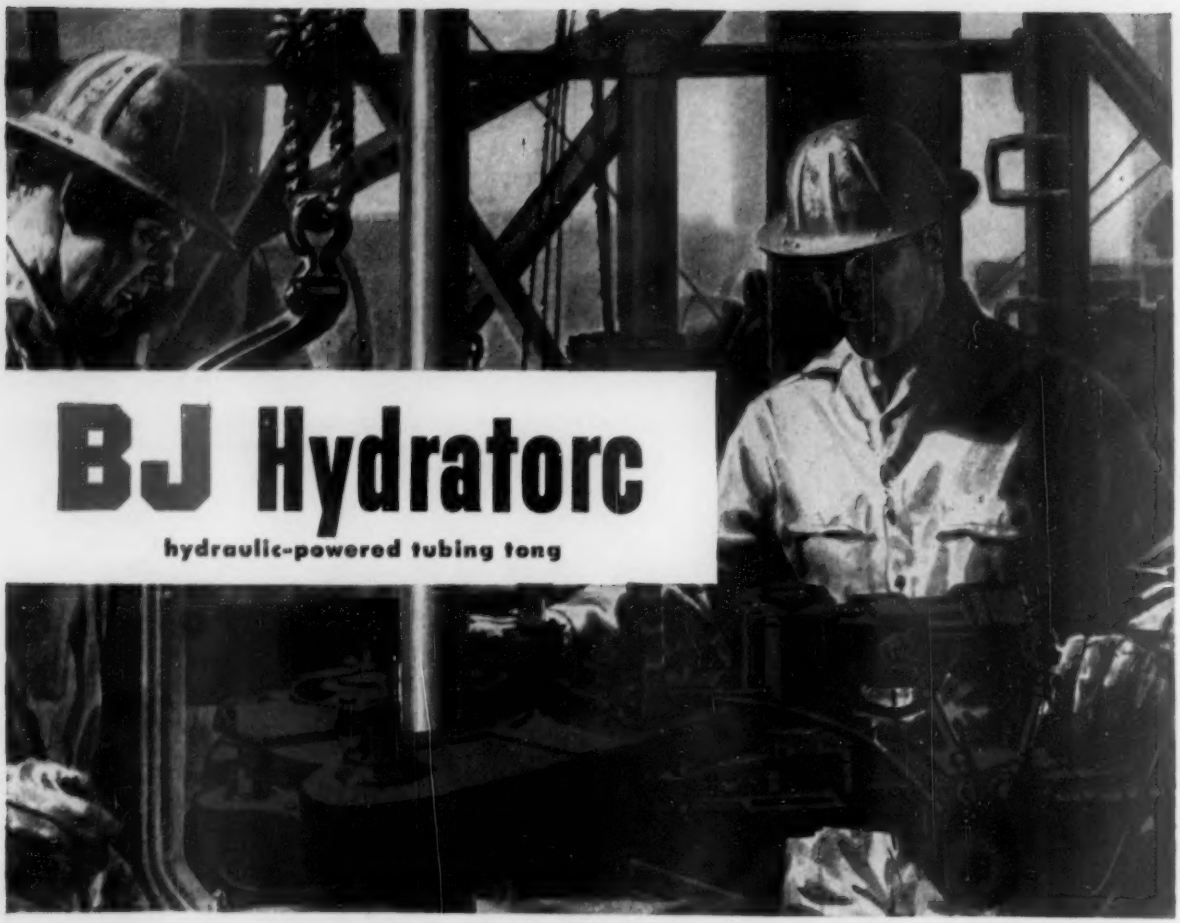
Auxiliary facilities include electric generators, radio system, and necessary storage tanks for water, glycol, and product.

The process design was developed by Black, Sivalls & Bryson, Inc., while Gasoline Plant Construction Corp. did the construction design, engineering, and actual construction of the plant.

Acknowledgments . . . The cooperation of Renwar Oil Corp.'s management in the releasing of this information is hereby gratefully acknowledged.



PROCESSING VESSELS at the plant include test tank, test separator, low-temperature separator, and glycol-oil separator (large drum in background).



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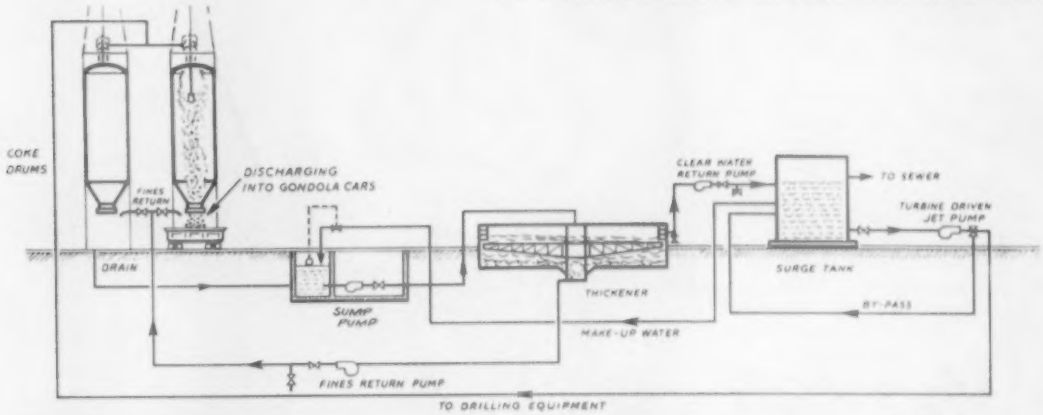
HYDRAULIC DECOKING

. . . here's how Cities Service does it



This simplified diagram shows water flow in hydraulic decoking at Cities Service Oil Co.'s East Chicago, Ind., delayed coking unit. This unit has a capacity of 300 tons of coke per day. Work is now under way to expand this capacity to 400 tons per day with a second unit.

1 **First step** in hydraulic decoking is to bore a hole through the coke bed with this boring tool. In the Cities Service operation, this is followed by a reaming tool. Use of the intermediate reaming step increases the turnaround speed.

2 **Final cutting tool** is equipped with four hydraulic jets, two projected horizontally and the other two upward at an angle so that both meet at the chamber wall.

3 **Separation** takes place after the water and coke fines are gathered in the sump and pumped to the thickening tank. Here coke fines are recovered as a slurry and the clear water is pumped through the surge tank. From there it passes to the jet pump.

4 **Turbine-driven pumps** like the above then increase its pressure and return it to the cutting jets. These multistage centrifugal pumps supply 1,100 g.p.m. at 1,500 psi.—the cutting pressure on which hydraulic decoking depends. (Photos courtesy Worthington Corp.).

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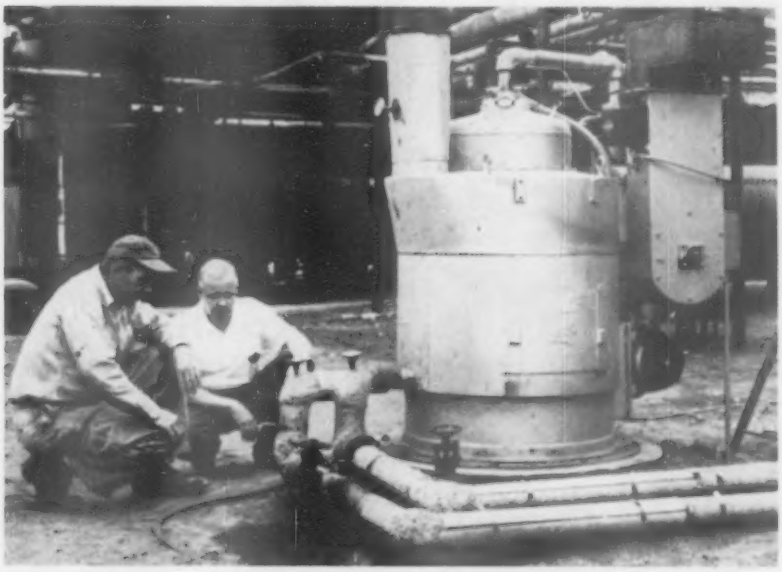

REHEATING reduced crude to 780° F. with this hot-oil heater prior to reprocessing brought a 16 per cent increase in output on one of Oriental Refining Co.'s crude distillation units.

New hot-oil heater boosts crude-distillation output

THE Oriental Refining Co. has achieved a 16 per cent increase in the output of the crude-distillation unit at its Denver refinery by using a newly developed hot-oil heater to reheat reduced crude to 780° for reprocessing. With this technique, Oriental has extracted an additional $100 worth of salable products a day from its crude-distilling unit.

At the present time, 15 gal. per minute of reduced crude are drawn off the bottom of the crude fractionating tower at about 630°. This oil is pumped into the coils of the hot-oil heater where hot gases from the gas fire raise the temperature to 780°. Then the reheated crude is pumped back into the crude-distillation unit. By doing this, the hourly output of the tower has been increased from 60 to 70 bbl.

To develop this compact heater, Johnson Mossman, superintendent of Oriental's Denver refinery worked with engineers of Vapor Heating Corp., Chicago. The basic heater design employed is similar to the Vapor-Clarkson steam generators the company makes for railroad diesel engines and for oil-field use in producing 600-lb. steam pressure for cleaning paraffin from field lines. The main difference between the oil heaters and the steam generators is that oil instead of water is pumped through the coils.

Fuel for the new oil heater is gas produced by one of the refinery's thermal cracking units. The intensity of the forced-draft fire is manually controlled by the operator to heat the oil going through the coils as desired between 750° and 780°. When pumping 15 gal. per minute through the heater, the heater is transferring about 760,000 B.t.u. per hour to the reduced crude oil. New pumps on order will increase this volume through the coils to the point where 1 million B.t.u. will be transferred to the oil. The manufacturer is also working on a larger hot-oil heater to release 3 million B.t.u.

The heater is easy to operate—one switch turns on the electric motor driving the forced-draft blower, a transformer supplies spark for the gas pilot light, and an electric solenoid valve shuts off the fire if there is an electrical failure.

Oriental's refinery at Denver processes about 3,500 bbl. of crude oil per day into gasoline, kerosine, diesel fuel, bunker C, and other products.

Beach ball used to clean lines

A BEACH ball is used at Taylor Oil & Gas Co.'s McAllen, Tex., plant as an aid in cleaning tile drainage and flare lines.

The ball is inflated to the size of the line and inserted through a riser, which is upstream of several other risers in the line. A slug of water is pumped behind the ball and forces it through the line to the next riser—some 200 ft. downstream. Where the ball is reinserted into the line and the procedure repeated until it comes to the end of the drainage line. During its passage through the line, the ball forces dirt and scale ahead of it which can be conveniently removed.

It is also used on flare lines, where its purpose is to cleanse the line of any accumulated liquids which may have entered the line during a surge. In this case, the ball is inserted through a hole especially cut in the flare line. Again water is pumped behind it to force it through the line. It in turn forces liquids and any dirt ahead of it until it reaches the flare stack, where the ball is retrieved and dirt and liquids removed from the system.

The ball has the advantage of being able to pass over small irregularities in the line and is, of course, an inexpensive item. At the same time, it eliminates the digging up of lines just to clean them.

Rack aids emptying of chemical drums

AT the Stratton plant of Southern Minerals Corp., a simple means is employed of emptying the drums of chemical used to prevent algae formations on the cooling towers.

It consists simply of a drum rack the height of a truck bed which holds

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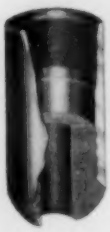

This is Product No. 102—Baker Cement Guide Shoe—used in combination with a Baker Cement Float Collar when one float valve is considered sufficient, and a stop for the cementing plug is desired above the shoe. Also used in combination with Baker FILL-UP Collars or FLEXIFLOW Collars.

This is Product No. 101 M&F—Baker Cement Float Collar, usually positioned just above the shoe joint to provide a "stop" for the cementing plug. Used in combination with any type of Baker Cement Float Shoe, Guide Shoe, or "Whirler" Shoe, selected to meet the customer's specifications.

This is the new Baker Differential FILL-UP Shoe—Product No. 1081—which permits the casing to fill automatically from the bottom (while it is being run) to within 90% of the fluid level of the annulus. By using *both* the FILL-UP Shoe and its companion FILL-UP Collar, an 81% fill is secured. It's new—ask for brochure.

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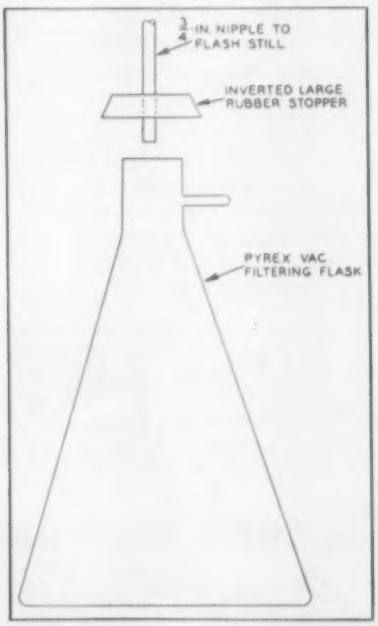
the drums to be emptied. An air line is run to the vicinity of the drums and a regulator installed which will give sufficient pressure to just lift the liquid over the wall of the vat under the cooling tower. A pop valve is installed on this line. However, no valves are installed on the discharge of the drum in order to be sure that excessive pressure will ever be put on the drums to cause rupturing.

It is a simple matter for the truck to back up to the rack and roll of enough drums for a supply of chemical and the laboratory man can without further help empty the drums or any part of them into the plant water.

Rubber stopper seals vacuum flasks

IN pilot-plant work using a flash still operated under vacuum, pyrex vacuum-filter flasks can be used as flash-still receiver pots. A vacuum seal can be obtained by using a large rubber stopper in an inverted position to fit flat against the top of the flask.

These rubber stoppers are fitted over the ¾-in. nipples from the flash-still collecting points. The vacuum flasks can be used to replace the more expensive ground-glass-joint round pots. Suggestion was by J. H. Heidebrecht of Phillips Petroleum Co.



ADDITION of an inverted rubber stopper makes this vacuum filter flask double as a flash-still receiver pot.

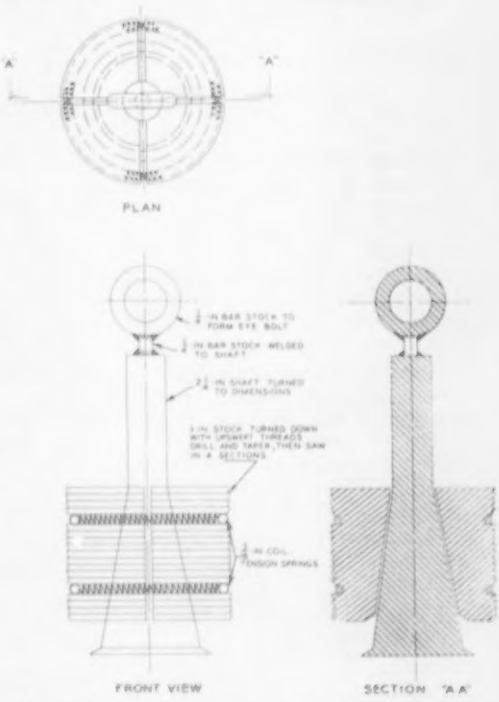
Attachments improve a welding truck

FAB ARC WELDING CO. of Victoria, Tex., has equipped this welding truck with an all-steel bed and has added accessories that make it an unusually handy maintenance vehicle. Notice how the compact placement of accessories leaves room for a large work area on the truck bed.

For faster, safer tube lifting . . .

REPLACEMENT of tubes in water-tube boilers in the past has required the presence of three men in the firebox in addition to one man in the drum. Because these men must climb ladders with the tube in their hands to insert the end in the upper drum, a safety problem exists.

The tool suggested for easy lifting of tubes is designed to be inserted inside the upper end of the boiler tube. An eye bolt is formed from ¼-in. bar stock (see drawing). A rope or chain extending from the boiler floor to the drum is fastened to the eye bolt. When tension is applied, the tool grips the inside surface and allows the tube to be raised and pulled into place into the correct hole. There it can be nailed or made fast by one man in the upper drum. After tube is fastened it can be released simply by reducing the tension on the rope. With the use of this tool only two men are required for installation of tubes, whereas four were previously required. The tool is applicable to all types of boilers and so has wide application. Suggested by H. N. Toland of Phillips Petroleum Co. natural gas department.



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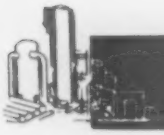
by P. B. Conlan



Controlling Slime and Algae Growths—3

Using Chlorine, Copper, and Phenolic Compounds

THE chlorine demand of a water may be reduced to a minimum by employing the chlorine-ammonia process. When chlorine and ammonia are both present in water, monochloramine, dichloramine, or trichloramine are formed, depending upon the pH value of the water. By comparison with chlorine, the chloramines are only weak oxidizing agents. By information of the chloramine, the toxic action of chlorine is retarded and longer contact time is required for destruction of bacteria. However, these materials retain their toxicity to microorganisms while reducing the amount of chlorine wasted on oxidizable materials present in the water. Chloramine residuals are more stable in the presence of organic matter.

The chlorine - ammonia process was developed originally to prevent chlorinous tastes and odors in water and to restrain the development of chlorophenolic odors in chlorinated waters. Ammonia can be added to the water either as a gas, an aqueous solution of ammonia, or an ammonium salt. Where appreciable quantities are required, it is more economical to employ the liquefied gas. The dosage of ammonia depends primarily on the natural ammonia content of the water and the quantity of chlorine applied. Excessive ammonia concentrations must be avoided, for this affects the germicidial action of the chlorine and reduces the toxicity of the treatment.

While this treatment has been used successfully in the control of algae in distribution lines, swimming pools, and open reservoirs, it has generally been superseded by the more efficient chlorination practices. The process has not been used widely in the control of slime and algae in industrial cooling-water systems because it possesses some of the disadvantages of chlorine and requires additional feeding equipment. However, it has been applied in special cases such as where chlorine demand of the water is high.

Author is with W. H. & L. D. Betz Co., Philadelphia.

Copper salts . . . Copper sulfate is one of the oldest and most widely used algicides. The toxicity of this material is due to the presence of the copper ion. Since the amount of copper required to kill different types of algae varies considerably, it is desirable to study the particular offending organisms so that the necessary dosage may be applied.

While copper salts are toxic to fish, various fish exhibit different degrees of sensitivity toward the copper ion. Recently, investigators have shown that fish mortality was not due entirely to the toxic effect of copper ion in the treated water. The mortality was shown to be due partially to clogging of the gills with dead organisms that had previously existed in the water.[2]

In the quantities in which it is usually applied for prevention of algae growths in water-treatment systems, the copper ion content of the treated water is below that present in many common human foods and is also below the concentration permitted by the U. S. Public Health Service drinking-water standards.

The effectiveness of copper salts in the control of algae is nullified at the higher pH values since the copper ion is precipitated as insoluble copper hydroxide. However, by employing copper salts in conjunction with surface-active agents, toxicity is greatly increased and precipitation of the copper ion is prevented. Further improvements of this development include the use of wetting agents which permit the copper ion to penetrate the various slime and algae growths.

Copper sulfate solutions are corrosive to iron and steel, and therefore corrosion - resistant feeding equipment is required. In the control of slime and algae in cooling-water systems, copper sulfate—or a specially prepared copper sulfate base algicide—is generally slug-fed. The dosage as well as the frequency of feeding is usually governed by the results observed.

Recently, copper sulfate has been fed along with chlorine and ammonia for the control of algae growths in municipal storage basins and distribution lines. In this process, copper sulfate is added at the same point as the chlorine and ammonia. The amount of copper required is much less than would be necessary if the copper were fed alone. Also, the quantities of ammonia and chlorine are less than would be required if these materials were fed without copper.

The efficiency of this combination is believed to be due to the formation of a cuprichloramine.[2] In this process, the desired toxic residual of copper ion is maintained in the water at relatively high pH when copper sulfate is added with the proper relative quantities of chlorine and ammonia. This treatment has not been used for the control of slime and algae growths in industrial cooling-water systems.

Phenolic compounds . . . Of the phenolic compounds used for control of slime and algae growths, sodium pentachlorophenate is the most widely used in industrial cooling-water systems. This material is soluble and stable in alkaline waters and does not react with most organic and inorganic chemicals which might be present in the system. Because of its toxicity to fish and animals, it may be necessary to carefully regulate the concentration of sodium pentachlorophenate in the blowdown discharge from the cooling system. In addition to sodium pentachlorophenate, sodium trichlorophenate has also been employed for control of slime and algae growths in cooling-water systems.

Slug feeding of the pentachlorophenate has proven more effective than continuous feeding. Usually, sufficient chemical is added rapidly so as to establish a concentration of 200 p.p.m. in the circulating water. When the concentration is depleted, another slug is added.

Reference

2. Smith, Marsden C., J.A.W.W.A., 43, pp. 763-69, 1951.

ENGINEERING FUNDAMENTALS

Summary of Equations for Pressure-Buildup Curves

by Dr. R. F. Nielsen

IN measuring pressure buildup in a well after shut in has been used to measure formation permeabilities, static reservoir pressure, and "skin effect" or abnormal resistance or conductivity near the well bore, two procedures may be followed. The first is to shut in the well and surrounding wells until a uniform pressure is built up in the formation. Then flow at a constant rate for a time t and, while the pressure is falling, shut it in and record bottom-hole pressures as a function of time.

Following Van Everdingen[1] and Horner[2] at shut in:

$$p_e - p_{wi} = \frac{q\mu}{4\pi Kh} \times \left(\ln \frac{Kt}{f\mu c\, r_w^2} + 0.81 \right) + SE \quad (1)$$

where: p_{wi} is bottom-hole pressure at shut in (psia.); p_e is static formation pressure; q is rate in reservoir cu. ft. per day; μ is viscosity in cp; K is permeability in perms (6.3 times the permeability in darcies); h is sand thickness in feet; f is fractional porosity; c is fluid compressibility in $psi.^{-1}$; r_w is well radius in feet; and SE is the skin effect in psi.

Skin effect is assumed constant for any given rate, since it is supposedly near the well bore. Positive skin effect implies abnormally high resistance or damage. Shut in is considered equivalent to superposing a negative q for Θ days on the positive q, continued for $t + \Theta$ days giving:

$$p_e - p_w = \frac{q\mu}{4\pi Kh} \ln \frac{t + \Theta}{\Theta} = \frac{2.3\, q\mu}{4\pi Kh} \log \frac{t + \Theta}{\Theta} \quad (2)$$

That is, after certain initial transient effects, a plot of p_w against $(t + \Theta)/\Theta$ on semilog paper should give a straight line if theory applies.

Author is associate professor of petroleum and natural-gas engineering, Pennsylvania State University.

The slope M (change in p_w per cycle) is $M = 2.3\, q\mu/4\pi Kh$, from which K (perms) can be calculated if other quantities are known. This is effective permeability to the fluid flowing. If the line is extrapolated to $(t + \Theta)/\Theta = 1$, $(\Theta = \infty)$, p_e should be obtained. Skin effect may then be calculated from Equation 1, using p_{wi}, bottom-hole pressure at shut in.

Second procedure . . . Another procedure, more applicable than the first if the well is part of a pattern flood, is to have the well at steady state before shut in, so that:

$$p_e - p_{wi} = \frac{q\mu \ln (r_e/r_w)}{2\pi Kh} + SE \quad (3)$$

Superposing a negative q (see Equation 1):

$$p_e - p_w = \frac{q\mu}{2\pi Kh} \times \left(\ln \frac{r_e}{r_w} - \tfrac{1}{2} \ln \frac{K\Theta}{f\mu c\, r_w^2} - 0.405 \right) = \frac{q\mu}{2\pi Kh} \times \left(-\tfrac{1}{2} \ln \frac{K\Theta}{f\mu c\, r_e^2} - 0.405 \right) \quad (4)$$

A plot of Θ against p_w should give a straight line on semilog paper after disappearance of shorter transients, slope being again $2.3\, q\mu/4\pi Kh$ from which K or Kh may be calculated. Skin effect may then be calculated (theoretically) from Equation 3, p_e being pressure at r_e, radius over which logarithmic pressure distribution may be assumed. Value of Θ should not exceed time necessary for the transient boundary to travel distance r_e, approximately:

$$\Theta\,(\text{max.}) = \frac{f\mu c\, r_e^2}{4K} \quad (5)$$

where t is in days.

An equation by Van Everdingen eliminates the necessity of knowing p_e and r_e to find skin effect. If, in the first procedure, a point Θ is taken small compared to t, then Θ in the numerator of Equation 2 may be dropped. Whence subtracting Equation 2 from Equation 1:

$$p_w - p_{wi} = \frac{q}{4\pi Kh} \times \left(\ln \frac{K\Theta}{f\mu c\, r_w^2} + 0.81 \right) + SE \quad (6)$$

Equation 6 may also be derived for procedure of flowing to steady state before shut in, by subtracting Equation 4 from Equation 3. An independent value of h is needed to find K.

Miller, Dyes, and Hutchinson give curves which, over a range, are represented by:

$$\mathbf{p} = \ln (r_e/r_w) + \tfrac{1}{2} (\ln \mathbf{t} + 0.809) \quad (7)$$

where

$$\mathbf{p} = \frac{0.007\, hK\, (p_w - p_{wi}^*)}{q\mu} \quad (8)$$

and

$$\mathbf{t} = \frac{0.000264\, Kt}{f\mu c\, r_e^2} \quad (9)$$

Units are md., hr., $psi.^{-1}$, cp., ft., and reservoir bbl. per day. The well is flowed to steady state, and p_{wi}^* is bottom-hole pressure at shut in if there were no skin effect. Slope of the semilog plot in their units is $M = 163\, q\mu/Kh$. Values of K and t (hr.) from a point on the graph is used to find $\mathbf{t}$ by Equation 9 (this should be between 0.01 and 0.1). This $\mathbf{t}$ is used to find $\mathbf{p}$ by Equation 7; then, taking p_w corresponding to t, p_{wi}^* is found from Equation 8 and p_e from radial formula:

$$q = \frac{0.007\, hK\, (p_e - p_{wi}^*)}{\mu \ln (r_e/r_w)} \quad (10)$$

Skin effect is the difference between $p_{wf}{}^{*}$ and p_w at shut in. Equation 7 may be shown to be the same as Equation 4.

Equations for buildup are applicable to decline curves obtained on water-injection wells, the difference being the change in sign.

If an immobile liquid is present, K is effective permeability to fluid flowing. Value of c is affected by presence of the immobile fluid. If, for instance, only water is moving and there is immobile oil at saturation $S_o = 1 - S_w$, then:

$$c = c_w S_w + c_o S_o \qquad (11)$$

Subscripts refer to water and oil. For the hypothetical case of oil and water flowing in the same ratio throughout the radius of drainage, then $k_o/\mu_o + K_w/\mu_w$, or (K_o/μ_o) (1 + WOR) must be substituted for K/μ.

The equations may often be useful only qualitatively, such as in determining the effect of remedial operations. Since well radius appears in the equations, shot wells will usually show negative skin effect if bore-hole radius is used.

References

1. Van Everdingen, Petr. Trans. A.I.M.E., 1953, p. 171.
2. Horner, Trans. 3rd World Petr. Congress, 1951.

ELECTRIC LOGGING—50

How Logging Speed Affects Radioactivity Logging

by R. I. Martin

A THIRD factor of fundamental importance in radioactivity logging is the logging speed. This is related to the time constant because, if the speed is increased, the recording instrument will not follow the changes in gamma-ray intensity so closely.

This is shown in Fig. 1 by the trend of the crossed circles, which are based on a logging speed three times as great, or 2,160 ft. per hour. It may be seen that even though the bed is thick, 18 ft., the curve barely reaches the maximum. The mid points of the slopes are offset about three times as much.

Author is assistant professor of petroleum engineering, Missouri School of Mines and Metallurgy.

Because of this large offset, and also because the maximum value is barely obtained opposite a thick bed, it is obvious that a detail log could not be obtained at this speed, and with this time constant. A speed of 2,160 ft. per hour is quite a slow logging speed at the present time.

Adjusting to Stronger Radioactivity

If the radioactivity is stronger, a smaller time constant may be used. This will permit faster logging speeds. A working rule is that the counter should move no more than its own length during the period of the time constant used. This, however, is still a high speed. For example, 2,160 ft. per hour is not very much faster than the speed dictated by this rule, which would be 2,060 ft. per hour.

The response to thin beds may be deduced from Fig. 1. The boundary effects at the base of the peak will remain, and will approach closer together as the bed thickness is reduced.

Fig. 2 shows a comparison of an S.P. curve with two gamma-ray curves taken at different speeds. The sand at 8,740 ft. shows up much less clearly on the fast run. In a similar manner, the base of the sand at 8,950 ft. is no longer sharply defined.

While the general appearance of the two gamma-ray logs is similar, most of the detail is lost in the faster survey.

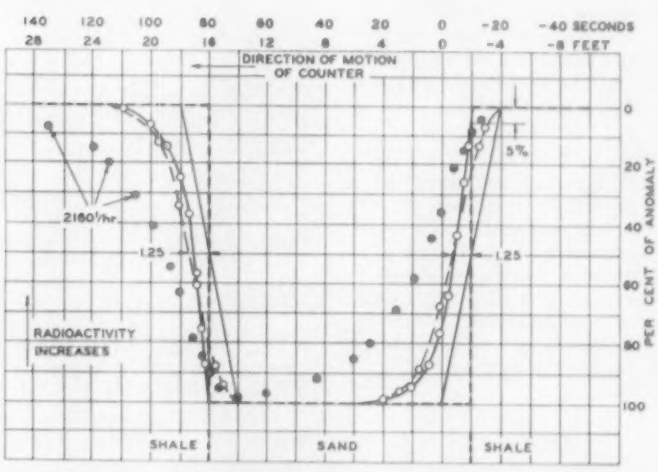


Fig. 1—The effects of counter length, time constant, and logging speed as related to radioactivity. Both figures from Kokesh, "Gamma-Ray Logging," The Oil and Gas Journal, July 26, 1951.

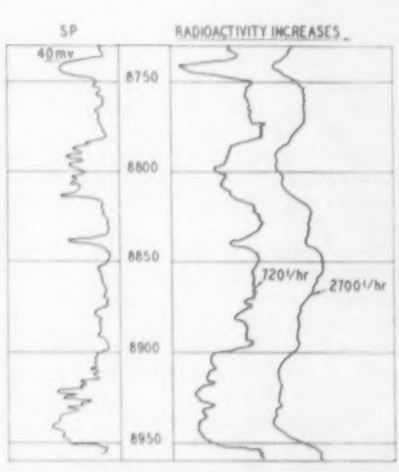


Fig. 2—A field example showing the difference in logging curves obtained at a fast and a moderate logging speeds.

Here's an easy way to

Simplify Your Liquid-Hydrocarbon Mixing . . .

by Max Berger

THIS alignment chart gives a quick, easy answer to the problem of mixing crudes, or any hydrocarbon liquids, to get a desired resulting A.P.I. gravity.

The nomograph solves the equation:

$$\frac{\text{Barrels high A.P.I.}}{\text{Barrels low A.P.I.}} = \frac{(\text{A.P.I. mid} - \text{A.P.I. low})(\text{A.P.I. high} + 131.5)}{(\text{A.P.I. high} - \text{A.P.I. mid})(\text{A.P.I. low} + 131.5)}$$

A.P.I. values will be designated as **high, low,** or **middle.** The middle A.P.I. which is the desired value, must always be between the high and low values. In other words, in mixing crudes of different A.P.I. gravities, the resulting mixture will have an A.P.I. value **between** the two original A.P.I. values.

Example . . . How many barrels of crude, A.P.I. 45°, must be mixed with how many barrels of crude, A.P.I. 25°, to get a resulting A.P.I. 33°?

Data:

A.P.I. high = 45 A.P.I. mid = 33

A.P.I. low = 25

Make a mark on A.P.I. low scale on the right at 25. Make a mark on the right A.P.I. middle scale at 33. Connect the two points with a line, and extend it to the left until it touches the scale labeled barrels high A.P.I.

Now make a mark on the A.P.I. middle scale on the left at 33. Make another mark on the left A.P.I. high scale at 45. Connect the two points with a line and extend it to the right until it touches the scale labeled barrels low A.P.I.

Now connect the barrels low A.P.I. point with the barrels high A.P.I. point and make a mark where this line crosses the diagonal index line. Any line drawn through this index point touching the barrels high A.P.I. scale and barrels low A.P.I. scale will give the barrels of each needed to make a mixture of A.P.I. 33. For example: 870 bbl. of A.P.I. 25 mixed with 654 bbl. of A.P.I. 45 will give a resulting mixture of A.P.I. 33. The quantity of the mixture will be 654 + 870 = 1,524 bbl. Or, 500 bbl. of A.P.I. 45 mixed with 665 bbl. of A.P.I. 25 will give a resulting mixture of A.P.I. 33. The quantity of the mixture will be 500 + 665 = 1,165 bbl.

The barrels scales are graduated 0-100. By moving the decimal point, the scales may be read 0-10 or 0-1,000 or 0-10,000, or any other desired decimal range, and the nomograph can be used as described above.

If it is desired, the barrels scale may be used to designate gallons, cubic feet, cubic centimeters, or any volume unit, so long as the same unit is used throughout the problem.

Derivation . . . S_o = specific gravity of mixture; S_a = specific gravity of one component; S_b = specific gravity of other component; B_a = barrels of one component; B_b = barrels of other component; $A.P.I._a$ = gravity of one component; $A.P.I._b$ = gravity of other component; $A.P.I._o$ = gravity of mixture; 42 gal. in a barrel; 7.5 gal. in a cubic foot; A.P.I. = gravity °A.P.I.

$$\frac{(62.4 \times 42/7.5)(B_aS_a + B_bS_b)}{(42/7.5)(B_a + B_b)} \times 1/62.4 = S_o$$

$$S_o = \frac{B_aS_a + B_bS_b}{B_a + B_b}$$

$$S_o(B_a + B_b) = B_aS_a + B_bS_b$$

$$S_oB_a + S_oB_b = B_aS_a + B_bS_b$$

$$S_oB_a - S_aB_a = B_bS_b - S_oB_b$$

$$B_a(S_o - S_a) = B_b(S_b - S_o)$$

$$S = \frac{141.5}{\text{A.P.I.} + 131.5}$$

$$S_o = \frac{141.5}{A.P.I._o + 131.5}$$

$$S_a = \frac{141.5}{A.P.I._a + 131.5}$$

$$S_b = \frac{141.5}{A.P.I._b + 131.5}$$

$$\frac{B_a}{B_b} = \frac{(S_b - S_o)}{(S_o - S_a)}$$

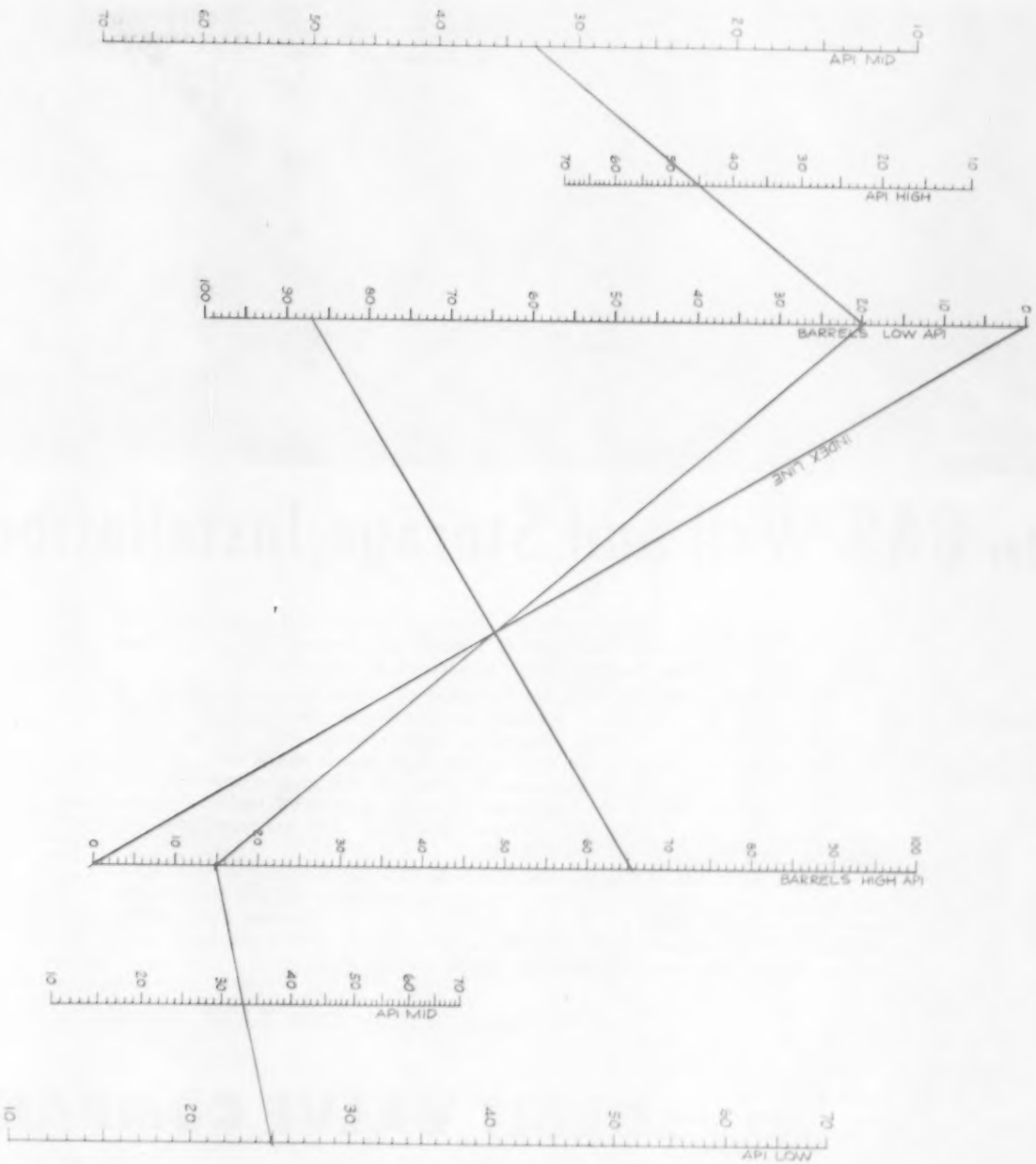
$$\frac{B_a}{B_b} = \left[\frac{\frac{141.5}{A.P.I._b+131.5} - \frac{141.5}{A.P.I._o+131.5}}{\frac{141.5}{A.P.I._o+131.5} - \frac{141.5}{A.P.I._a+131.5}}\right]$$

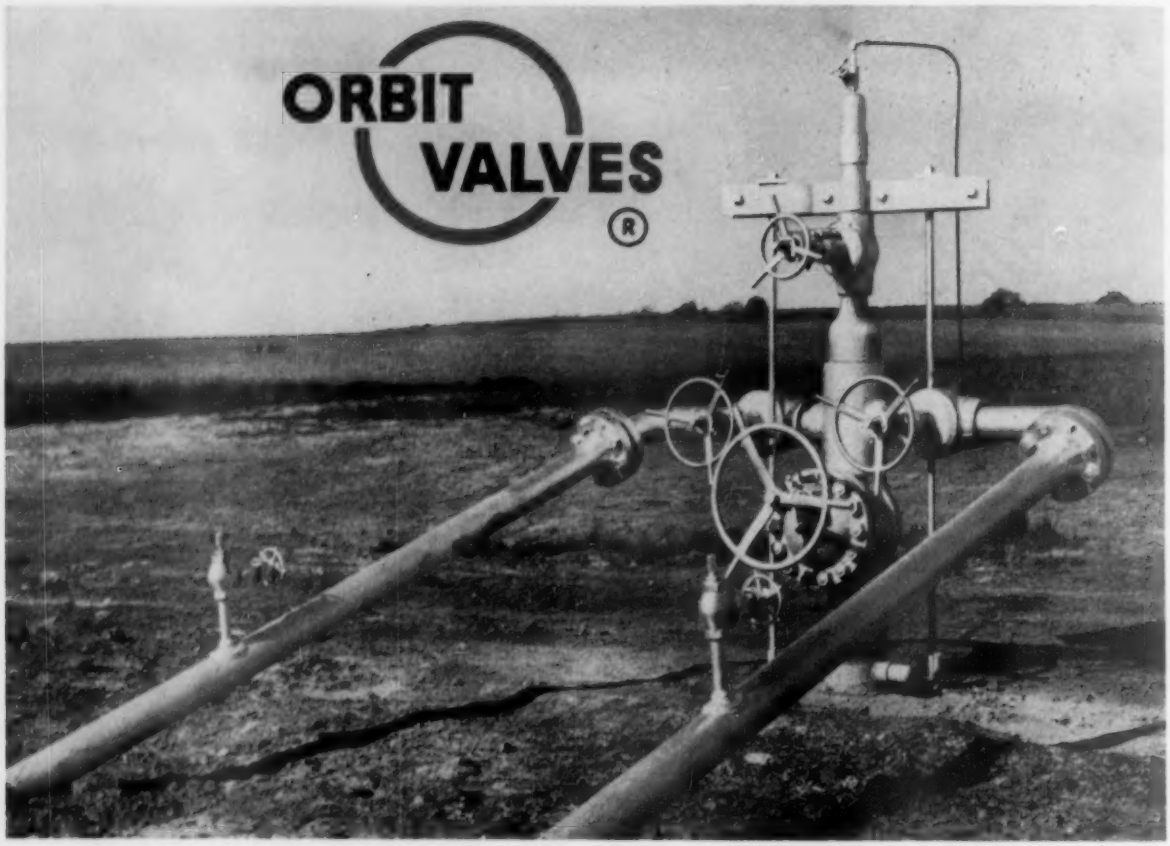
$$\frac{B_a}{B_b} = \left[\frac{\frac{141.5(A.P.I._o+131.5) - 141.5(A.P.I._b+131.5)}{(A.P.I._b+131.5)(A.P.I._o+131.5)}}{\frac{141.5(A.P.I._a+131.5) - 141.5(A.P.I._o+131.5)}{(A.P.I._o+131.5)(A.P.I._a+131.5)}}\right]$$

$$B_a/B_b = \frac{(A.P.I._o - A.P.I._b)(A.P.I._a - 131.5)}{(A.P.I._b + 131.5)(A.P.I._a - A.P.I._o)}$$

$$S_o = \frac{(B_aS_a \times 62.4 \times 42/7.5) + B_bS_b \times 62.4 \times 42/7.5}{64 \times (B_a \times 42/7.5) + (B_b \times 42/7.5)}$$

. . . by using this nomogram to find proper mixing proportions





for GAS Well and Storage Installations

The above picture shows a typical natural gas storage well installation. The owner has used an **ORBIT DRILLING VALVE** as a casing master valve and **ORBIT FORGED STEEL FLOWLINE VALVES** on the takeoffs.

ORBIT DRILLING VALVES are furnished in carbon trim only and should not be used in services where excessive corrosion may be expected. **ORBIT DRILLING VALVES** will hold pressure in one direction only and should be installed so that the arrow on the body of the valve points in the same direction as line of flow. They are easily opened or closed by one man — requiring only two and a quarter turns of the handwheel. Furnished in screw end and flanged end. Sizes: 5½" OD, 7" OD, 8⅝" OD and 10¾" OD. Test pressures: 1000 lbs., 2000 lbs., 3000 lbs., 4000 lbs., and 6000 lbs.

ORBIT FORGED STEEL FLOWLINE VALVES are furnished in both screw and flanged end, carbon or stainless trim, rising stem type API Oil Field Rating and ASA Ratings. Sizes: 1", 1½", 2", 2½", 3" and 4". **Venturi Type ORBIT FORGED STEEL ASA CLASS VALVES** are available in 150 lb. rating, 2", 2½", 3" and 4"; 300 lb. rating, 6" only, and 600 lb. rating, 6" only.

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by W. L. Nelson
Technical Editor

PROGRESS IN METALS

Application of Metals and Alloys in Petroleum Refining

Part 5

THE applications and services listed in recent and the next several installments summarize much of the material published on the Progress in Metals page since January 1953. The compositions of the various alloys or steels listed here were published in the form of an alphabetized list in the issues of September 14, 1953-January 4, 1954.

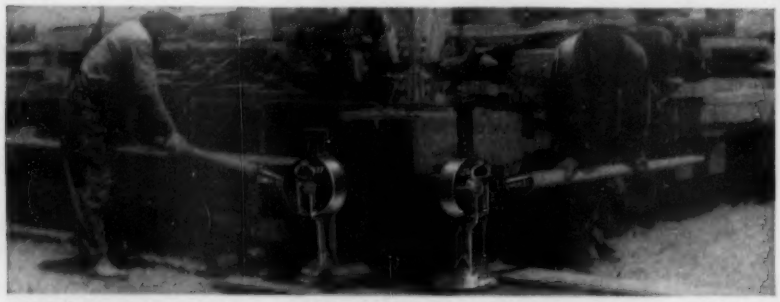
Any listing of applications will obviously be incomplete and note especially that the most common materials such as gray cast iron, malleable iron, carbon steel, ductile iron, brasses, bronzes, etc., are seldom listed even though they may be used more widely than the alloys or alloy steels.

Equipment, Corrosive Agent, or Service	Some of the Materials that have been Employed*†
Hydrogen sulfide water or gas coolers	Carbon (Karbate), aluminum alloys, Alclad
Hydrogen sulfide refinery corrosion	(See sulfide corrosion)
Instrument parts	Nickel or German silvers, brasses, bronzes, stainless steels, Monel, Inconel, etc.
Instrument parts—low coeff. expansion:	
To 400° F.	Invar, 36 per cent Ni iron
To 650° F. (sealing through glass)	42 per cent nickel iron
To 1,000° F.	47-50 per cent nickel iron
Instrument tubing	Copper; Types 4 SO, 3 SO, or 52 SO aluminum alloy
Isomerization:	
Dilute HCl or with antimony trichloride	Hastelloy B linings, or nickel
200° F.—trichloride saturator, vent gas scrubber, catalyst removal column, HCl reboiler, stripper, and catalyst stripper	Monel metal
194° F. catalyst contactor	Nickel
Pump parts and hot acid equipment	Hastelloys and Ni-Resist iron
Low coefficient expansion	(See Instruments)
Low (very) temp. services—(15 Charpy impact):	
To minus 75° F.	1 per cent Ni low carbon steel
To minus 100° F.	2 per cent Ni low carbon steel
To minus 150° F.	3½ per cent Ni low carbon steel
To minus 175° F.	4 per cent Ni low carbon steel or with 0.3 Cr, 0.16 Va
To minus 350° F.	8½ per cent Ni low carbon steel or aluminum alloys
To minus 400° F.	13 per cent Ni low carbon steel
To minus 450° F.	25-24 Cr-Ni; 36 Ni iron; or 18 Mn, 10 Cr steels
Highest impact strength	Monel, L nickel, Cr-Ni stainless, 25-20 stainless, aluminum alloys, 36-50 Ni irons and pure metals
Oxygen exchangers, fractionators at —300° F.	Aluminum alloys (highest aluminum)
Valves at —150° F.	2 to 3½ Ni steel
Valves at —300° F.	5 to 8½ Ni steel, stainless steels, and Monel
Vessels at —150° F.	3½ Ni steel
Vessels at —200° to —300° F.	8½ Ni steel
Vessels at —350° F.	Stainless Cr-Ni steels, Monel, L nickel, copper
Mercaptans	Aluminum alloys
Methyl ethyl ketone (MEK)	Aluminum alloys, Alclad
Monoethanolamine (MEA) coolers, exchangers, etc.	Carbon (Karbate), aluminum alloys, Alclad
Naphthenic acids, 550° F., along with other refinery agents	Types 316 and 317 stainless steels and Inconel; CF-8M (18-8-3) castings. (Plain carbon steel is better than plain 304 or 410 stainless)
Nitriding (at 950° F.)	16 Cr, 15 Ni, 3 Si steel; or 57 Ni, 12 Cr, 1.7 W alloy; the austenitic stainless steels are used but not dependable
Nonsparking (tools, etc.)	Aluminum bronze and beryllium coppers
Oxidizing atmospheres (furnace):	
Scales at 1,050° F.	2 per cent chromium steel (Si also helps)
Scales at 1,100° F.	5 per cent chromium steel (Si also helps)
Scales at 1,200° F.	8 per cent chromium steel
Scales at 1,300° F.	12 per cent chromium steel
Scales at 1,600° F.	18 per cent chromium steel
Scales at 1,800° F.	22 per cent chromium steel
Scales at 2,000° F.	25 per cent chromium steel
Very high temperature	HF (20-10) or HE (29-9) Cr-Ni steel castings
High temperature and sulfidizing	HC (26-4), HD (28-5) or HH (25-12) Cr-Ni steel castings
Phosphoric acid:	
Liquid blowback in poly plant	Monel metal
Low conc.—high temperature	Types 316 and 317 stainless or CF-12M castings
High conc.—high temperature	Hastelloys B and C and carbon (Karbate) linings
Storage, 75-85 per cent at 150° F.	Monel metal
Phenol, wet vapor	Nickel (or clad) or Hastelloys A, B, and C.

*Abbreviations—Type (302, 316, etc.) means A.I.S.I. designations. Q and T means "quenched and tempered." H T means "heat treated." Carb. means "carburized and case hardened." Numbers as 3140, 2335, etc., refer to S.A.E. steel designations. Chemical elements—C, carbon; Ni, nickel; Cr, chromium; Va, vanadium; Si, silicon, Mo, molybdenum; Mn, manganese; HF, HC, CF, etc., are designations of the Alloy Castings Institute.

†Obviously, plain carbon steel, cast iron, brass, etc., are used for most services and they will not always be listed. Likewise, many materials have been omitted because their use has escaped notice.

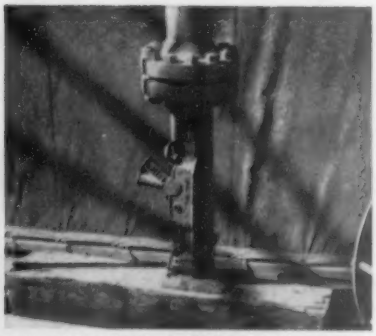
Shortcuts for Drillers
with Simplex Jacks



SOMETIMES IT TAKES TWO . . . With right and left hand toes, respectively, Simplex Nos. 126 and 127 ratchet lowering geared jacks can be used as a pair for lifting and lowering rigs or other heavy equipment. 25-ton capacity on cap or toe. Powerful geared mechanism makes jack faster and easier to use than standard speed types.

BIG PULL . . . For your cable tightening and wire pulling jobs. Here's the Simplex Jack that works fast on slack cables, gives hefty pull for final tightening. No. 324 is light, handy to use.

OTHER SIMPLEX JACKS FOR DRILLERS include the famous "center-hole" Jenny and the Re-Mo-Trol, a remotely controlled ram and puller. There is also a complete line of Simplex hydraulic and screw jacks. General Catalog No. 53 lists them all—write for a free copy.



"THE MUD LINE STANDPIPE WAS POUNDING LIKE *!?*" according to the pumper, "so we jacked it up". This is only one way the versatile Simplex Emergency Jack offers an easy short-cut to problems in the oil country. With 15-tons capacity at four lift points, Model 310A also lifts, skids and levels rigs, moves and braces machinery, pulls positions, clamps and supports pipe.

LIFTS IN A HURRY . . . For extra speed and ease of handling on many heavy duty oil field lifting jobs. Simplex Model 2029 lifts 20-tons on cap *or* toe. Single acting, ratchet lowering lever type.

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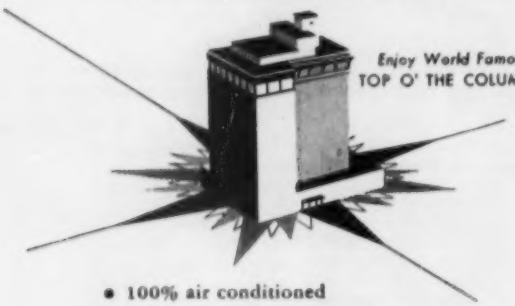

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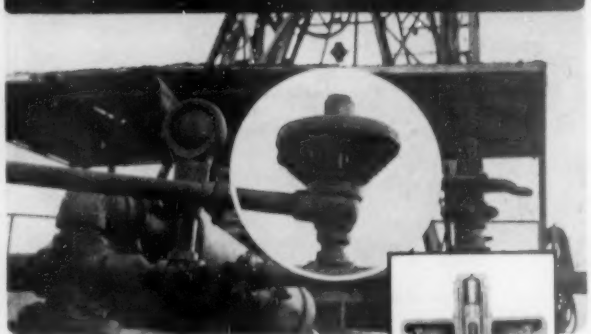

Kinzbach Model 112 Relief Valve shown in closed position.

The Kinzbach Model 112 Relief Valve provides safer, more efficient pump or pressure relief and greater flexibility in operations than any other valve. It *snaps open* for instant pressure relief at maximum volume and *snaps shut* to restore circulation instantly and automatically after a predetermined pressure drop. The basic design positively prevents chatter.

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Among the Drilling Contractors

Brown Puts Down 90 Wells In California During Year

Ninety wells, totaling 504,789 ft. of hole, were drilled by Brown Drilling Co. in California during 1954, E. C. Brown, president, reports. Footage averaged approximately 5,609 ft. per well.

In addition, 59 wells were drilled in Texas for the company's account. Depths ranged from 300 to 6,600 ft.

From the beginning of the company in 1937, it has drilled 1,031 wells with an aggregate footage of 4,246,942 ft., averaging 4,119 ft. per well.

The company also has three contract rigs running in Australia, and one in Trinidad.

Atkins Drilling Co., San Antonio, is drilling on a 6,000-ft. contract it has with Gulf Coast Leaseholds, Inc., of Houston. It is listed as 1 Kelly, in the D. O. Warren League & Labor.

Rhodes & Hicks' tools are drilling for H. R. Smith and associates, of Alice, Tex., at a wildcat location 6 miles southeast of Elmendorf, in Wilson County, Southwest Texas. Location is for 1 Shook, in the Vicente Zepeda Survey. It is a 4,000-ft. test.

Pyburn-Langford Drilling Co., Shreveport, has a well-deepening job under way on the west flank of South Sarepta field, in Bossier Parish, northwestern Louisiana. It is Kinsey & Kinsey's 1 Kinsey, Kinsey & Antrim, in 30-22n-11w. Hole was drilled in 1952 to 9,812 ft., where tests in the Cotton Valley formation failed to establish commercial production. It will be carried to the Smackover around 12,000 ft.

"Must be a driller looking for work—no creditor ever knocked for 4 hours."

Speer Forms Drilling Firm

Speer Drilling, Inc., is a newly formed drilling firm operating in southeastern Kansas and northeastern Oklahoma. Principal owner is Woody Speer, who has been operating independently in the above area the past year. Main office of the new company is in Wichita.

McVay & Stafford Drilling Co. is working on another deep test for Amerada Petroleum Corp. in the North Echol area, northeastern Lea County, New Mexico. It is Amerada's 2-EB State, in 27-10-37, on the southeast side of the area. Drilling is to be carried to the Devonian around 12,000 ft.

Howard Parker is contractor on an 8,200-ft. wildcat test H. J. Chavanne, trustee, is putting down 2 miles southwest of Fannett, in Jefferson County, Texas Gulf Coast. Location, in the E. Stone Survey, is about 1 mile north of production in Fannett field. Designation of the test is 1 J. J. Burrell Estate Gas Unit.

Trant Drilling Co. has a new wildcat operation under way in Trinity County, in the Texas Upper Gulf Coast area. It is a 9,600-ft. Woodbine test for P. R. Rutherford, of Houston. Location is at 1 Lawson, in the Joseph Henderson Survey, 9 miles northwest of Groveton.

Hall & Stewart Drilling Co. is under contract to Humble Oil & Refining Co. for a deep wildcat test 3½ miles northeast of Lovington, in Lea County, New Mexico. Location is for 1 Ault et al, with spot location in 28-15-36. Hole is projected to 13,600 ft.

M & M Drilling Co. has a contract with Monterey Oil Co. for a 10,500-ft. test at a wildcat location 7 miles northeast of St. Gabriel field, in Ascension Parish, southern Louisiana. It will be drilled as 1 Duplessis, with location in 9-9s-3e.

Parker Drilling Co., Tulsa, has a new deep wildcat test under way in southern Grady County, Oklahoma. It is being drilled for John L. Paxton, of

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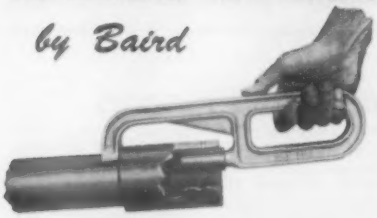
TUBING GRIPPER

by Baird



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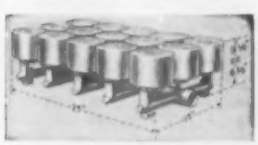

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Fort Worth, and Allen E. Humphrey, of Dallas, at 1 Quinlan Ranch. Location is 1½ miles southwest of Bradley, in 26-4n-5w. Hole is scheduled to be carried to approximately 13,000 ft. as Springer test.

Zack Brooks Drilling Co., El Dorado, Ark., has the drilling contract for a 10,500-ft. Cotton Valley test 10 miles west of Monroe, in Ouachita Parish, northeastern Louisiana. Location, in 19-17n-2e, is on a block assembled by Milton J. Houston, of Shreveport. The contractor holds an interest in the venture.

R. W. Rine Drilling Co., Wichita, Kans., has moved a rig to a wildcat location 6 miles northeast of Forgan in northern Beaver County, Oklahoma, where it will drill a 6,500-ft. test for Lion Oil Co. at 1 Hodges. Location is in 21-6n-24eCM, about 3 miles from the Kansas line. The test is Lion's first in Oklahoma.

Circle Drilling Co., Lake Charles, La., has a new contract operation in West Baton Rouge Parish, southeastern Louisiana. It is a 9,500-ft. wildcat test for Redlands Oil Co., of Oklahoma City. Location is 2 miles north of Lobdell field, at 1 Morley Cypress et al, in 33-6s-11e.

Tri-State Drilling Co., Laurel, Miss., is moving a rig to Soso field, where it will drill for Vaughey & Vaughey at 1 Abrams, in 26-10n-13w, in Jones County. Hole is projected to the 12,000-ft. Lower Cretaceous-Rodessa sands being actively developed in that field.

Falcon Seaboard Drilling Co., Houston and Tulsa, has another deep test scheduled for the newly opened southwest extension area at Fausse Pointe, in Iberia Parish, southern Louisiana. It is a southwest offset to the extension discovery-well drilled for Cities Service Oil Co. It is a 9,800-ft. test to confirm discovery production in sand at 9,700 ft. In addition to having the drilling contract, Falcon Seaboard has an interest in the operation. The new test is 2 Mestayer, located in 33-11s-8e.

Sunnyland Contracting Co., Rayne, La., is scheduled to drill another wildcat test for Sun Oil Co. in Bay County, northern Florida. It will be Sun's third test in the immediate area. Location is in 3-1s-12w, is 3½ miles south of Fountain. Hole will be carried to 5,000 ft. The contractor has a new operation of its own under way in Jefferson County, Mississippi. It is a 6,000-ft. Wilcox test, 2 miles north of McNair, at 1 Hurley, in 48-8n-2e.

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Pipeline Patrol

. . . Report on Construction

Under Way, Contracted, and Planned

PIPELINE activity as reported below by the Oil and Gas Journal is compiled from information received from pipeline companies and contracting firms.

These projects include those planned, proposed, under way, and contracted. Uncontracted projects are indicated by • preceding the job.

Crude-Oil Pipelines

Ar-Mex Pipe Line Co.—Company has applications for two lines before the Office of Defense Mobilization Board for rapid amortization approval.

1. A crude-oil line from Albuquerque, N. M., to Phoenix, Ariz. This line would serve a 20,000-bbl. refinery being planned by Frost & Associates of Dallas.

2. A crude-oil line from Guernsey, Wyo., to Albuquerque.

Magnolia Petroleum Co—This company will operate a 48-mile, 12-in. submarine pipeline for itself and Continental Oil Co., and Newmont Oil Co. The line will run to blocks off the coast of St. Mary's Parish, Louisiana, and will have a capacity of 50,000 bbl. per day. Brown & Root, Houston, has the contract and expects to be finished by the middle of 1955.

Minnesota Pipe Line Co.—Williams Brothers Co. has contract to build this 260-mile, 16-in. crude line from Clearbrook to Hastings, Minn. The line, to cost $12,500,000, is the southern end of a system which will move crude from Fosterton field, Sask., to Great Northern's refinery which is building in the Minneapolis-St. Paul area. Present plans call for completion by July 1955.

Standard Pipe Line Co.—Company plans to build two crude lines. Applications are now before the Office of Defense Mobilization for rapid amortization approval.

1. A 350-mile, 16-in. crude line from Glendive, Mont., to Guernsey, Wyo., to connect with Platte Pipe Line Co.'s system there.

2. A 330-mile, 16-in. crude line from Wink, Tex., to Albuquerque, N. M. This line would serve a 10,000-bbl. refinery being planned by Frost & Associates of Dallas.

Texas New Mexico Pipe Line Co.—Firm has awarded contracts for 74 miles of crude lines in eastern New Mexico and West Texas. Ferguson Construction Co., of Eunice, N. M., will lay 43 miles of 8-in. from Maljamar station in Eddy County, New Mexico to Tulk pool in Lea County and Drickey pool in Chaves County, New Mexico. McVea & Barlow, Inc., Odessa, Tex., will lay 24 miles of 8 and 10-in. from Dora Roberts Ranch in Midland County, Texas, to Basin Pipe Line System's station at Midland, Tex.

Trans Mountain Pipe Line Co.—Engineers Limited Pipeline Co. has contract to lay 27 miles of 20-in. from Laurel to Burlington, Wash., and 9 miles of 16-in. of lateral to Shell Oil Co.'s new refinery at Anacortes, Wash. The $2,750,000 job will begin in spring and end in mid-summer.

• **Union Oil Co. of California.**—Planning construction of a 60-mile crude line from its Clara Valley field to its Wilmington refinery. 12-in. line. Bids being asked.

• **West Coast Pipeline Co.**—The off-again-on-again plans for this crude line from near Wink in West Texas to near Norwalk in California are presently before the Office of Defense Mobilization. A three-man board of nonindustry members recently recommended that the project be dropped. They questioned the ability of West Texas to produce enough crude to supply both the East and West Coasts in time of war. The three-man board favored building a line from California's Elk Hills Naval Reserve to be held in standby for possible future need.

Products Pipelines

• **American Pipe Line Co.**—Has received ODM approval to amortize 40 per cent of $178,000,000 with a rapid writeoff on proposed line to run from Gulf Coast area to New York City area. Bids for pipe requested.

• **H. W. Bass & Sons, Inc.**—Company is planning on a 152-mile, 4-6-in. L.P.G. line from Goliad Corp.'s plant in Live Oak County, Texas, to Corpus Christi.

• **California - Oregon Pipe Line System.**—103 miles 6-in., proposed, Crescent City, Calif., to Medford, Ore.

Cimarron Valley Pipe Line Co.—Subsidiary of Chicago Corp. is building an 81-mile, 6-in. products line from Chamlin Refining Co.'s refinery at Enid, Okla., to Oklahoma City. River Construction Co., of Fort Worth, is doing the work.

Great Lakes Pipe Line Co.—Company has awarded contracts in two sections on its 163-mile, 10-in. line between El Dorado, Kans., and Kansas City, Mo. Ray L. Smith & Son, Inc., are laying a 91-mile spread between El Dorado and Burlingame, Kans. M-R Co., Wichita, is working on the remaining 72 miles into Kansas City.

• **International Pipe Line, Inc.**—132 miles 8-in., proposed, Wrenshall to Minneapolis, Minn. Cost: $4,200,000.

• **Keystone Pipe Line Co.**—Company has ODM writeoff of 25 per cent for $1,875,000, 48-mile, 8-in. products line from Boot, Pa., to the Fullerton, Pa., terminal.

Malco Pipeline, Inc.—Company planning to build a 91-mile, 6-in. products line from its Prewitt, N. M., refinery to Albuquerque.

Moore Stoner Co.—Company has $2,500,000 tax amortization for a 200-mile, 6-in. products line from a connection with Oil Basin Pipe Line Co.'s terminal at Glendive Mont., to Minot, N. D.

• **Products Pipe Line Co.**—This subsidiary of Goliad Corp. has received a fast writeoff for 40 per cent of $126,000 and 25 per cent on $1,781,000 for L.P.G. line from the Wilcox natural-gasoline plant in Lavaca County, Texas, to Texas City. Panama-Williams Co. has contract. Completion scheduled for mid-summer.

Shell Pipe Line Corp.—65 miles of 12-in. products line from Baton Rouge, La., to Shell's Norco refinery. Houston Contracting Co. has contract. H. T. Muckley, Supt. Job held up indefinitely by right-of-way difficulties.

• **Sunflower Pipe Line System.**—Company proposes to build a 215-mile, 6-in. line to transport L.P.G. from six counties in western Kansas to Wichita. Application approved by Kansas Corporation Commission.

Pipeline Patrol

Texas Eastern Transmission Corp.—Company has asked FPC permission to abandon "Little Inch" gas line. If permission is granted, company will spend $71,000,000 converting the line to a products line with a capacity of 235,000 bbl. per day.

U. S. Gov't. Alaskan Products Pipe Line.—600 miles of 8-in. under way from Haines northward through Yukon to Fairbanks, Alaska. Williams Bros., McLaughlin, Inc., and Marwell Construction Co. are doing the work.

Natural-Gas Pipelines

• **American-Louisiana Pipe Line Co.**—1,121 miles of 30 and 22-in., 30-in., proposed, extends from North Tepetate, Acadia Parish, Lousiana, to near Detroit. The 22-in. starts near Payne, Ohio, extends to Bridgman, Mich. Estimated cost: $130,000,000. FPC approved.

• **Arkansas Louisiana Gas Co.**—136 miles of new line proposed, to be added to present system in Arkansas, Louisiana, and Texas. Estimated cost: $9,245,166. FPC approved.

• **Carolina Natural Gas Corp.**—185 miles 2-12-in., proposed later lines off Transcontinental in North and South Carolina.

• **Central Hudson Gas & Electric Corp.**—Company has filed application with FPC to construct 48 miles of 12-in. line from Albany to Kingston, N. Y. Line will be started and completed in 1955 if FPC approves.

• **City of Dalton, Ga.**—Proposes to build 39 miles of 8-in. from a point of interconnection with Southern Natural's Rome-Calhoun transmission line. Estimated cost: $2,940,000.

• **Colorado Interstate Gas Co.**—365 miles 22-in., approved by FPC, Green River, Wyo., to Denver, Colo., 1954.

• **Colorado-Western Pipe Line Co.**—454 miles of undetermined size pipe planned between Cortez in Montezuma County and Denver. Line would serve towns of Montrose, Gunnison, Salida, Fairplay and South Platte, Colo. Estimated cost: $30,000,000. Company also plans 254 miles of laterals to service Colorado cities not now receiving natural gas.

328-mile line, proposed, to run from a point in La Plata County in southwestern Colorado over the Continental Divide along the eastern slope to serve Pueblo, Colorado Springs, and Denver. Estimated cost: $21,600,000.

• **Hope Natural Gas Co.**—Proposing to build a 22½-mile extension of existing line from Boone County, West Virginia, to Logan-Mingo County line, West Virginia. Estimated cost: $930,000.

• **Houston Texas Gas & Oil Co.**—Company proposes to build three natural gas lines. One line would run from lower Rio Grande Valley to Chicago. The other line would go from southern Louisiana to New York City. Third line would run from Louisiana to Florida, 20, 24, 30-in. pipe considered in plans. Engineering firm reported preparing an economic report on the lines at present.

Kansas Pipe Line Corp., Inc.—Company proposes to build 16-20-in. line to Wichita. Starting point for line has not yet been established. The line, which would have a capacity of 100 million cu. ft. daily may start in the Barber-Harper County area 100 miles southwest of Wichita, or it may be necessary for the company to go farther west to the Hugoton field. The line will cost approximately $5,000,000 and will be entirely intrastate.

• **Kansas-Nebraska Natural Gas Co., Inc.**—Proposes to construct 206 miles of 6-12-in. pipeline to add to present system in central and northeastern Nebraska.

• **Manufacturers Gas Light & Heat Co.**—40 miles, proposed, Allegheny, Washington and Beaver counties, Pennsylvania.

213 miles, 3 to 26-in., proposed, various

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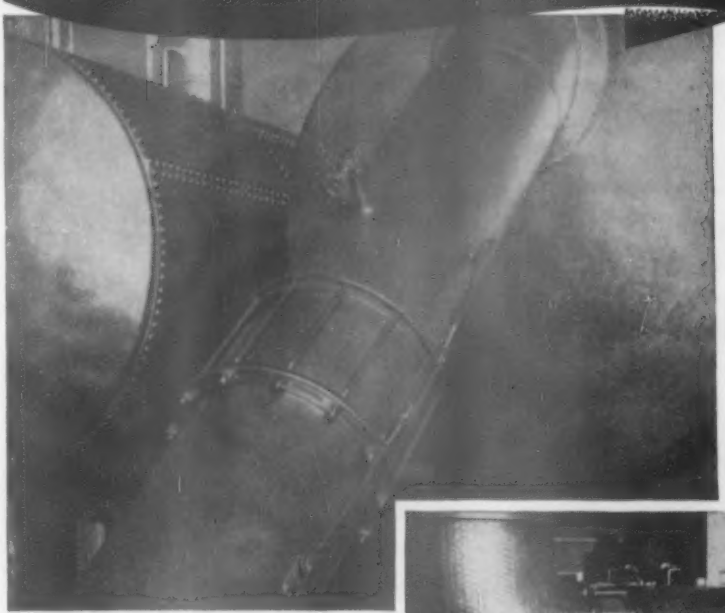

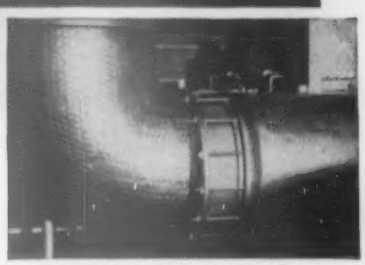

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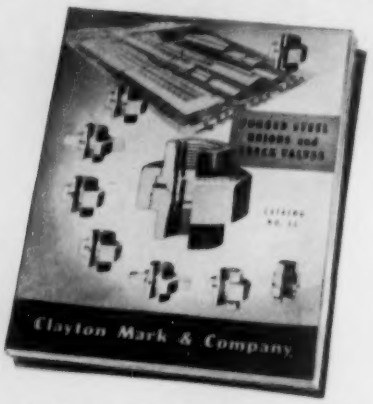

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Pipeline Patrol

points on system in Pennsylvania, West Virginia, and Ohio.

72 miles, 16-20-in., Doddridge, Wetzel and Marshall counties, West Virginia. Fulghum Contracting Co. doing work.

• **Michigan Consolidated Gas Co.** — 25 miles, 12-in., proposed, from near Sparta to Muskegon, Mich.

• **Michigan Wisconsin Pipe Line Co.**—251 miles, proposed, 24, 18, 12, 6, and 4-in. loops. Majority will be in Wisconsin.

• **Missouri Public Service Co.**—136 miles, 8-10-in., proposed, New Franklin to Trenton, Mo.

24 miles, 10-in., Johnson County to Clinton, Mo. FPC approved. Est. cost; $600,000.

• **Montana-Dakota Utilities Co.**—Proposes to build 56 miles of 2, 4, and 6-in. line from its 12-in. Cabin Creek - Bismarck line near Gladstone, N. D., to the towns of Lefor, Regent, New England, and Mott, N. D.

• Proposed 34½ miles of 12¾-in. line to run from Baker-Glendive field in Montana to Rapid City, S. D., and 14 miles of 12¾-in. to replace various lines in Park County, Wyoming, and Carbon County, Montana.

Natural Gas Pipe Line Co. of America.—Company has proposed a 280-mile line from Wise County, Texas, to Panhandle field in Texas where it would connect with the NGPLCA to Chicago.

• **Natural Gas Producers, Inc.**—This subsidiary of Colorado Interstate Gas Co. has applied to the Colorado Public Utilities Commission for permission to build a 48-mile, 10-in. pipeline to link Denver with northeastern Colorado gas fields. The company will also build 3 miles of 8-in. and 10 miles of 4-in. The entire project will cost $1,374,000.

• **New River Gas Co.**—50 miles, planned, Summers to Monroe counties, West Virginia, to Narrows and Dublin, W. Va.

• **North Dakota Natural Gas Co.**—This company has moved back into the gas picture in North Dakota with a bid to build a 274-mile, $11,017,200 system from Tioga to Fargo to Grand Forks. An original application filed several months ago was complicated by a later application filed by Northern Natural Gas Co., to serve the same area.

• **Northern Indiana Fuel & Light Co.**—35 miles, 8-in., planned, Edgerton to Auburn, Ind.

Northern Natural Gas Co.—Company has just recently finished a large summer expansion. Still planned are:

170 miles of 20-24-in. line in Minnesota and Wisconsin running to Duluth and Superior.

400 miles of 24-in. line from the Canadian border to tie in with its system at St. Paul-Minneapolis.

500 miles of 24 or 30-in. planned across North Dakota from Tioga past Minot to Fargo and from there eastward to the Twin Cities.

• **Northwest Alabama Gas District.** — 40 miles, 9-in., proposed, Southern Natural's line through Winfield to Haleyville, Ala.

• **Pacific Northwest Pipeline Corp.**—1,466 miles, proposed, Ignacio, Colo., to Bellingham, Wash. Approved by FPC.

380 miles, proposed, laterals and spurs off main line to Pocatello, Idaho, to Yakima, Wash.

• **Pine Tree Natural Gas Co.**—204 miles of undetermined size pipe to run from the Boston area to Bangor, Me.

• **Shenandoah Gas Co.**—40 miles, 3-4-8-in., proposed, Middleton, Va., to Martinsburg, W. Va. Est. cost: $1,470,000. FPC approved.

• **South Georgia Natural Gas Co.**—368 miles, 2-12-in., planned, Phenix City, Ala., to Tallahassee, Fla. (a) 12-in., Phenix City, Ala., to Albany, Ga., (b) 10-in., Albany, Ga., to Moultrie, Ga., (c) 8-in., Moultrie, Ga., to

Pipeline Patrol

Tallahassee. Est. cost: $9,000,000. FPC approved.

• **Southwest Alabama Gas District.**—150 miles, 10 and 8-in., planned, Phenix City to Dothan, Ala. Engineering Const. Co.

• **Tennessee Gas Transmission Co.**—Company has FPC authority to build 243-mile, 24-in. line from Hebron storage field in Potter County, Pennsylvania, to existing facilities near Greenwich, Conn. Company will also build an 18-mile connecting line between Hebron storage field and Harrison storage field.

• **Texas Eastern Transmission Corp.**—Proposed, 382-mile, 24-in. line from Kosciusko, Miss., to Beaumont, to connect with the existing 30-in. line there to Connellsville and replace the "Little Inch" in moving natural gas.

• **Texas Gas Corp.**—This firm will spend $3,500,000 on a line from Orange, Tex., to a connection with a new line of Transcontinental Gas Pipe Line Corp. in Cameron Parish, Louisiana. The project will call for crossing the Sabine River, building a compressor station, and a measurement station.

• **Transcontinental Gas Pipe Line Corp.**—Company has received FPC permission to loop 173 miles of its line between Texas and New York with 30 and 36-in. pipe, and to lay 58 miles of 12 and 16-in. lines. Project will cost $29,700,000.

• **Utah Natural Gas Co.**—Planning 40 miles from Orem to Salt Lake City, 16-in. pipe at later date. Contract not yet let.

Virginia Natural Gas Co.—153 miles, Buckingham to Richmond and Portsmouth, Va.

Westcoast Transmission Co., Ltd.—Company has signed agreement with Pacific Northwest Pipeline Corp. and has revived plans for its line from the Peace River area of Alberta to the United States border near Vancouver, B. C. Tentative plans call for work to begin sometime in 1955.

Foreign Crude-Oil Pipelines

• **Atlas-Dresser.**—Included in this company's agreement with the Argentine Government are plans to build a 400-mile, 16-in. crude line from Plaza Huincul area to Bahio Blanca.

Bombay Port Trust.—50 miles, 8 to 24-in., contracted, Bombay, India, to serve Standard Vacuum Oil Co., and Burmah Shell refineries. Merritt, Chapman & Scott Corp., contractors. (Crude and Products). Collins Const. Co. has subbed 84,000 ft. of Subaqueous work. Shutdown for Monsoon season during summer. Work was resumed September 15.

Compania Shell De Venezuela.—Company will build a pipeline from its Block I field off the western shore of Lake Maracaibo to its terminal at Palmarejo. The line will be known as "Lapline" and will run 18 miles in the lake and 27 miles on land. The underwater section will be 16-in., and the remainder will be 24-in.

Peace River Oil Pipe Line Co., Ltd.—Company plans to build a 16-in. line connecting Sturgeon, South Sturgeon, and Little Smoky fields in Alberta to a planned 106-mile, 12-in. line which would move the crude south to Trans Mountain Pipe Line Co.'s Edson, Alta., station.

• **Petroleos Mexicanos.**—145 miles, 12-in. considered, 18 de Marzo field via Reynosa to Monterrey, Mexico.

100 miles, planned, Isthmus of Tehuantepec, Jose Colomo to El Plan field, Minatitlan.

72 miles, 12-in., proposed, Poza Rica to Atzacapotzalco, Mexico.

Texas Petroleum Co.—Contract has been let to Foster Wheeler Corp. and Panama-Williams for a 119-mile, 12-in. crude line to move oil from Velasquez field in Colombia

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Pipeline Patrol

to a connection with the main Andian National system at Galan. Est. cost: $6,000,000.

• **Yacimientos Petroliferos Fiscales Bolivianos.**—170 miles, 4-in., planned, Bermejo to Tupiza, Boliva.

Yacimientos Petroliferos Fiscales Bolivianos.—Bolivian Government oil organization has awarded contract to Williams Brothers. Sudamericana, Ltd., to construct a 6-in. crude line from Camiri field to Yacuiba on the Argentine border. The project will cost approximately $2,500,000.

Foreign Products Pipelines

• **Empresa Nacional del Petroleo.**—80 miles, 6⅝-in., planned, Concon to Santiago, Chile.

• **Governments of South Rhodesia and Portuguese East Africa.**—200 miles, considered, Beria, Portuguese Mozambique to Umtalia, Southern Rhodesia.

• **National Fuel Oil Co.**—This company in Israel is a shareholder in a company which plans to build a products line between Haifa and Tel Aviv. The plans call for a 55-mile, 6-in. line in which the Government would own 10 per cent.

North Atlantic Treaty Organization (NATO).—1,920 miles, 4-10-in., to serve military bases in Western Europe (to connect with U. S. Government's St. Nazaire-Paris-Metz line). Contracted by Soc. Foster Wheeler Francaise.

Overland Pipeline Corp.—This South African firm has requested government permission to build a 350-mile line, to cost $8,450,000, from the South African coast to Rand, a plateau area in southern Transvaal where there is heavy petroleum consumption.

• **Petroleos Mexicanos.**—124 miles, 6-in., planned, Lagos to Guadalajara, Mexico.

54 miles, 6-in. planned, Lagos to Aguascalientes, Mexico.

82 miles, 8-in., planned, Salamanca to Lagos, Mexico.

• **United States Government.**—375 miles, 12-in., planned, St. Nazaire to Melun and Metz, France.

• **United States Navy Department.**—Proposed 300-500-mile line to be built in Spain to serve a proposed naval base and four large air bases which are also proposed under a defense agreement with the Spanish Government. No definite size or cost is known now.

Winnipeg & Central Gas Co.—Canadian company plans to build a $20 million butane-propane system. Company plans to get gas L.P.G. from Signal Oil & Gas Co.'s Tioga, N. D., plant and move it to Winnipeg. Size and route of the line has not been definitely established.

Foreign Natural-Gas Pipelines

Alberta Gas Trunk Line, Ltd.—This Canadian firm has let engineering contracts to two firms, Dutton, Williams Brothers, Ltd., and Mannix, Ltd., for a 300-mile, big inch gas-gathering system to collect Alberta's natural gas for transportation to Trans Canada Pipe Line Co.

Attock Oil Co.—Company plans to build 60-mile natural gas pipeline from Dhulian field to Rawalpindi in West Pakistan.

• **Empresa Nacional del Petroleo.**—80 miles, 10-in., planned, Concon to Santiago, Chile.

Petroleos Mexicanos.—205 miles 16-in. under way, Monterrey to Torreon, Mexico.

• **Petroleos Mexicanos.**—440 miles, 20-in., planned, Brazil to Tampico to Poza Rica, Mexico.

Sui Gas Transmission Co., Ltd.—Morrison-

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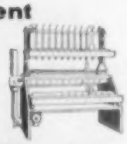

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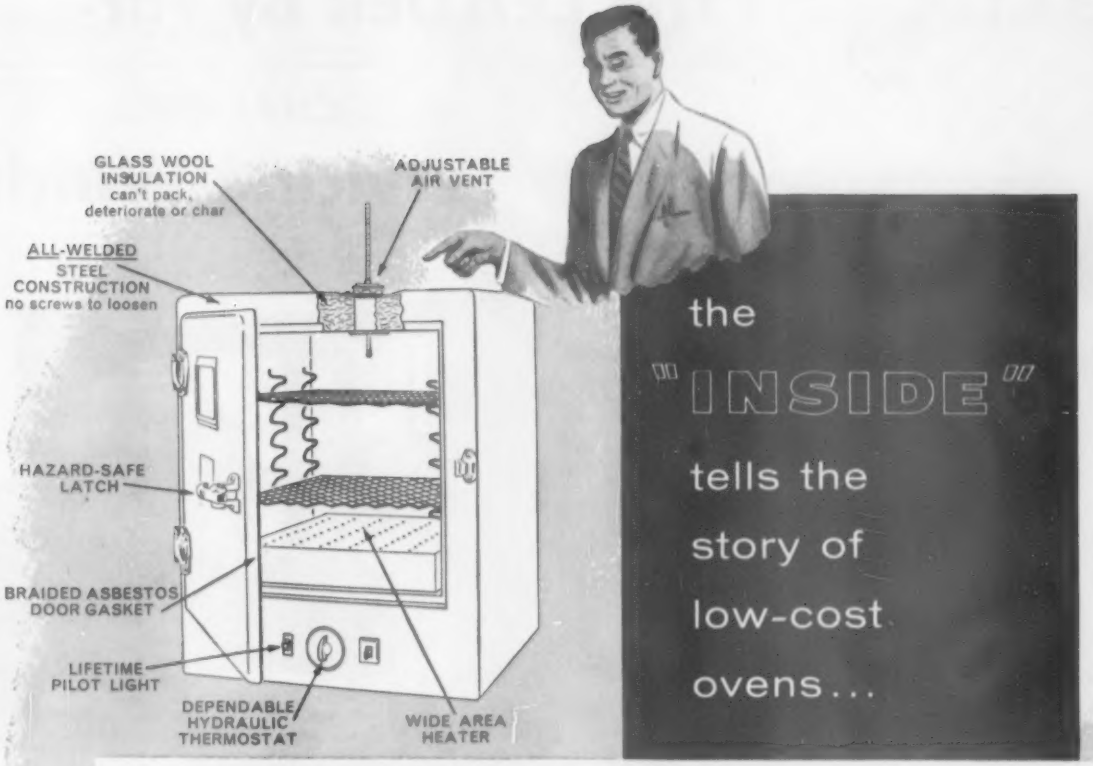

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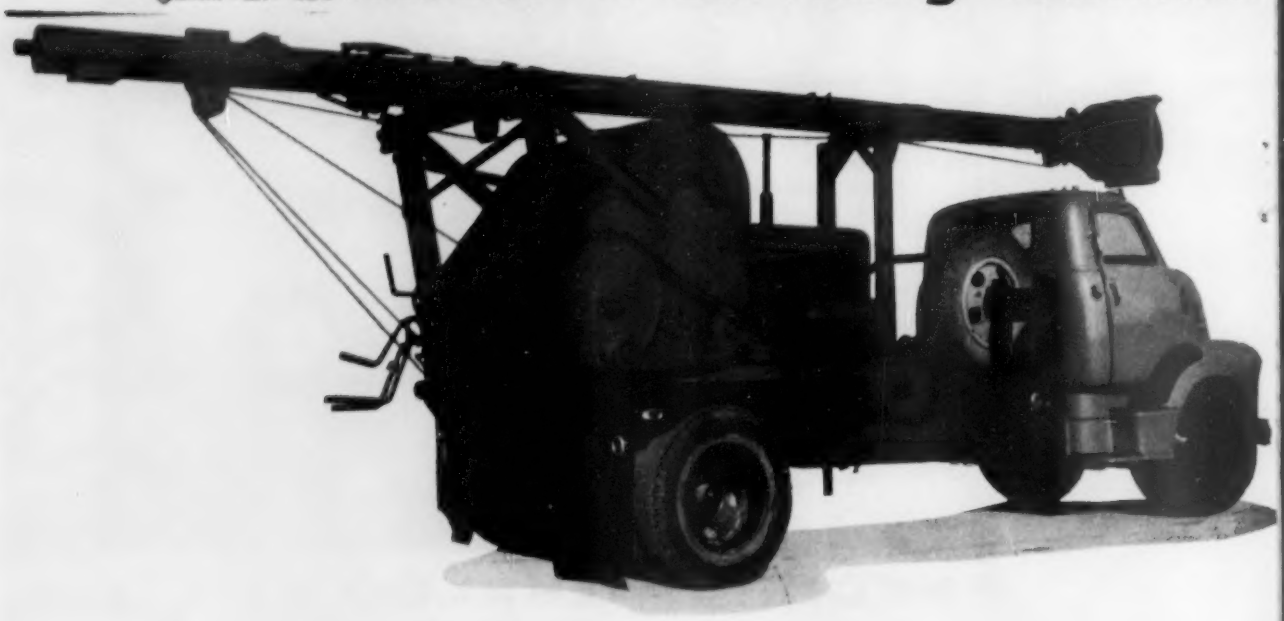

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Pipeline Patrol

Knudsen Construction Co. has contract to build 350-mile, 16-in. line from Sui field to Karachi in West Pakistan. Est. cost: $25,000,000.

• **Trans-Canada Pipe Lines, Ltd.**—Company planning 2,200 miles of 24-36-in. natural-gas line from the Alberta-Saskatchewan boundary to Toronto and Montreal. Also plans a 24-in. lateral from Winnipeg to Emerson, Man. Twenty-inch lateral from Niagara to Toronto now in operation.

Private Interests.—Proposes to build gas line from Gubik gas field near Navy Petroleum Reserve No. 4 in Alaska to Fairbanks. Line would be 450-mile, 8-in. line and Arctic Contractor, Inc., who handled engineering requirements and preliminary design estimated the line would cost $20,000,000, although later figures have been much higher than this.

Revenue from Pipelines Up

WASHINGTON.—The growth of oil pipelines is making them a bigger figure in the transportation field.

The Interstate Commerce Commission reported to Congress last week that the pipelines subject to its jurisdiction accounted for 3.5 per cent of the total transportation revenue in the year ended last June 30, as compared to 3.3 per cent in the previous year.

Transportation revenue of the oil carriers was placed at $603,669,000, an increase of $14,000,000 over the $589,360,000 collected in the fiscal year 1953.

In the same period, railroad revenues from passengers and freight dropped from 62.5 to 60.4 per cent, while motor-carrier revenues of property increased from 26.5 to 28.1 per cent and water carriers increased from 2 to 2.2 per cent. The nation's transportation bill amounted to $17,100,000,000 in the fiscal year 1954, a drop of $800,000,000 from the preceding year.

"I certainly hate to go through with another one of his tongue lashings."

20 Bell Holes Like This in One Day with a SHERMAN POWER DIGGER!

"Pay for themselves faster than most of our other equipment!" That's what R. Mannino & Sons, Westfield, New Jersey general contractors say about their Sherman Power Diggers.

A typical Mannino job was for the local gas company. Replacement of clamps and seals on gas mains required digging a series of bell holes. The Sherman Power Digger reduced digging time for the average bell hole to about fifteen or twenty minutes, making it possible to replace as many as twenty clamps a day.

If you now excavate by hand, or if your heavier equipment cannot work in tight spots, you, too, will find the versatile Sherman Power Digger practical and profitable. It's compact, flexible, fast, easy to operate. It digs in a fraction of the time and cost of manual labor—as deep as 10′ below grade in mud, hard-pan, shale, oiled roads, blacktop and stony ground.

Initial cost of the Sherman Power Digger is surprisingly low, maintenance simple and inexpensive. Write today for the whole story. Ask for Bulletin No. A15.

Designed, Engineered and Manufactured Jointly by
SHERMAN PRODUCTS, Inc.
Royal Oak, Michigan
WAIN-ROY CORPORATION
Hubbardston, Mass.

Patent No. 2,303,852
Other patents pending
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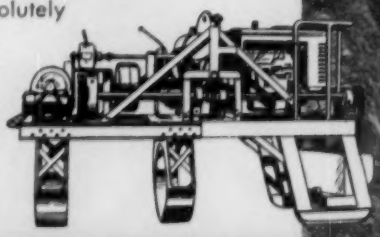

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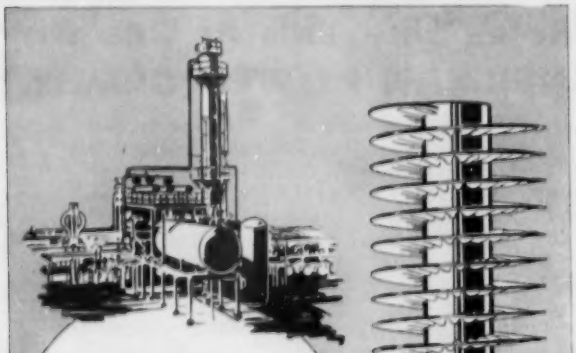

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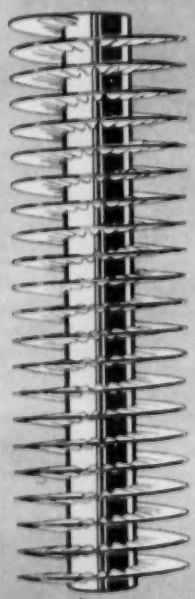

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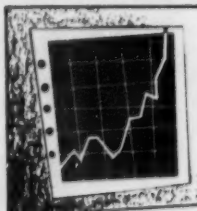

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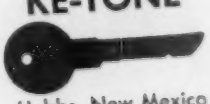

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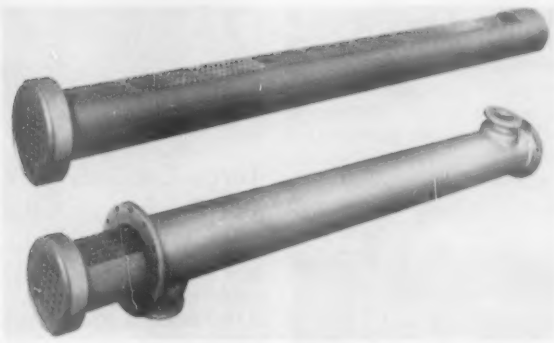
. . . What's New in Equipment?

Use the handy Time-Saver Cards ✔✔✔ to obtain additional information on these items

by Dan B. Miller



Graphite Exchanger Resists Shock

This latest development uses new concept in impervious-graphite bundle design. This new unit is designated the Impervite Cross-Bore exchanger. Simplified construction utilizes a solid bar of Impervite measuring the total bundle diameter. This bar is accurately drilled longitudinally and laterally. This design gives exceptional strength to the bundle and permits use of chemically impervious-graphite heat exchangers, even where severe mechanical shock is encountered. The new exchanger will withstand operating pressure in the 150 to 200-psi. range. This new exchanger is especially recommended for applications where excessive fouling on the shell side is encountered, because all passages are easily accessible by sliding the bundle out of the shell.

This Impervite bundle is made from selected graphite which is extruded, machined, and then impregnated with special resins. It is immune to the attack of all corrosives except a very few highly oxiding agents. It has a very high rate of thermal conductivity, is unaffected by thermal shock, and will withstand temperatures up to 340° F. (Higher operating temperatures can be accommodated by using Graph-I-Tite which is carbon-impregnated impervious graphite capable of withstanding temperatures up to 5,700° F.)

Impervite Cross-Bore heat exchangers can be used for heating or cooling and are furnished in the same shell housings as standard Impervite tube-and-shell exchangers. Shells are supplied in impervious graphite, special alloys, or can be rubber or lead-lined. *Falls Industries, Inc.*

Check No. 1 On The Time-Saver Card

●

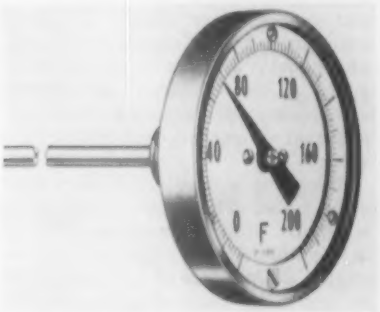
Antiparallax Thermometer Offers Accurate Readings

Accurate readings of process changes can now be obtained in the field with the same ease and economy as pressure readings as result of the development of a new all-stainless-steel, bimetal, dial thermometer.

To assure high accuracy in reading, this thermometer is constructed with a new, antiparallax dial. Graduations are carried on a raised ring, set close to the cover glass, with the index-type hand at the same level, thus overcoming perspective effect of pointer above dial and practically eliminating any chance of error due to parallax.

The combination of the stainless-steel case with gasketed heavy-glass front assures satisfactory operation under all conditions, and removes working parts from any danger due to corrosion or erosion.

A small diameter stainless-steel stem is mirror-polished with all joints welded, providing additional strength, rigidity, and tight closure against pressure from the process. Silicone dampening



of the element reduces further accelerating responsiveness.

Ranges are available from —80° to +1,000° F., with dials graduated in either Fahrenheit or Centigrade. *Manning, Maxwell & Moore, Inc.*

Check No. 2 On The Time-Saver Card

●

Mud Pump Incorporates New Design Features

The new Emsco D-700 slush pump has been developed to meet all the specialized mud-circulation requirements of jet bit, big hole, and deep drilling. A new power-end lubrication system uses two positive-displacement plunger pumps operating in parallel to assure proper lubrication to all bearings

and working parts. Long-life roller bearings are used throughout the power end.

New type tapered threads are incorporated in crosshead extension and pistonrod connections for tighter joints and quick removal. Threaded stuffing-box glands assure easier and more proper adjustment. Threaded valve-cover design enables quick valve inspections and reduces the weight of the fluid end and the frequently handled covers.

The pump also incorporates Fabriform construction, steel-power frame, and exposed liner design. Crossheads are equipped with replaceable Meehanite slippers which slide on Meehanite guides. Also included as standard equipment are piston-rod lubricator, pulsation dampener, and shear relief valve.

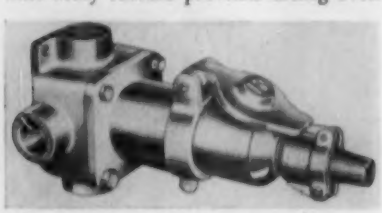
The pump is rated at 700-b.hp. input at 65 s.p.m. The length of the stroke is 16 in. With its maximum bore (8 in.), it will deliver 852 gal. of fluid per minute at a pressure of 1,197 psi. With its minimum bore (5½ in.), it will deliver 374 g.p.m. at a pressure of 2,727 psi. Weight is 37,500 lb. *Emsco Manufacturing Co.*

Check No. 3 On The Time-Saver Card

●

Explosionproof Connectors Made for Portable Equipment

Kilarc explosionproof plugs and receptacles are designed for safety in the electrical connection of portable equipment. A plug striking against the receptacle can't spark, and a safety time-delay feature prevents arcing even



when improperly sealed. The unit is U.L. approved and exceeds safety tests by a wide margin. Made of smooth, durable Alumalloy, the unit is lightweight and of rugged construction. It is rust and corrosionproof and is unaffected by moisture or industrial atmospheres.

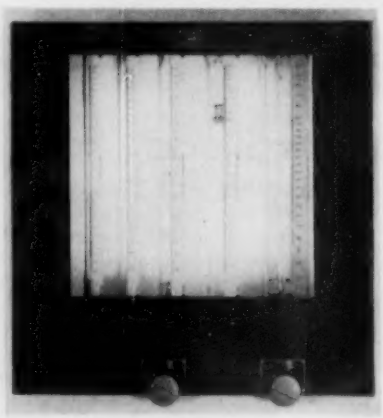
These explosionproof plugs and receptacles are available in many styles and sizes to fit various boxes and are made in 15, 30, 60, and 100 amp. *Killark Electric Manufacturing Co.*

Check No. 4 On The Time-Saver Card

Flowmeters Equipped With Explosionproof Lighting

An explosionproof, fluorescent direct-lighting system has been developed for industrial and laboratory flowmeters. It is now available as special equipment on single-stage and multiple-stage flowmeters manufactured by this firm.

This explosionproof back lighting is designed for flowmeters which are used to meter combustible liquids in areas where better lighting is required than is provided by the usual indirect, or reflected methods. Direct illumination of the metering tubes and the plastic, translucent scales in the flowmeter is provided from the rear, by standard

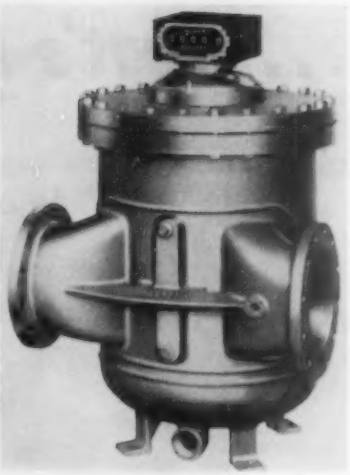


20-watt fluorescent lamps. Two of these lamps are used in multiple-stage flowmeters while only one is required to illuminate the single-stage model.

At the time unit is assembled, the ends of lamps are tightly sealed into prefabricated housings, making the lamps completely explosionproof. The housings are in turn fastened by means of brackets to a steel shell which surrounds the entire explosionproof lighting unit. This shell, forming the back panel of the flowmeter, can be easily removed intact to allow cleaning or lamp replacement.

Proper lighting density is achieved with a diffusion screen situated midway between the translucent scales and the fluorescent lamps. Light caught by this screen is transmitted forward where it passes through the permanently graduated, plastic scales. Should greater visibility be desired, different colored scales can be supplied, with each color keyed to a specific metering liquid. *Commercial Research Laboratories, Inc.*

Check No. 5 On The Time-Saver Card



Large-Capacity Meter Ideal For Product or Crude Oil

A new large-capacity meter is 10-in. size and is designed for 150 and 1,200 psig. working pressure. Capacity is 3,000 bbl. per hour. It is ideally suited for accurate measurement of finished product and crude oil. The meter is available with functional accessories, such as ticket printers, unit combinator equipment for combining the registration of two or more meters in a bank, and remote transmission. *Maintenance Engineering Corp.*

Check No. 6 On The Time-Saver Card

●

Plug Injector Operates Without Flow Interruption

Installed on the flow line at the well head the injector permits insertion of paraffin control plugs without interrupting normal flow so as to avoid shutdown or use of auxiliary bypass line. The plug-running operation can be performed in less than 30 seconds.

To operate unscrew handle-bar plug allowing gas trapped in upper chamber to escape through early opening vent. A swing check valve, normally held closed by spring tension, seals off plug-receiving chamber from flow line. Paraffin control plug is dropped into upper chamber. Screwing on handle bar plug seals vent and forces plug against swing check valve providing initial opening to balance pressures in plug chamber and flow line. Manually shoving push rod down moves plug past check valve into flow line making the plug-running operation positive regardless of flow rate.

Other features include elimination of oil spillage as there is no fluid to drain. Gas trapped in upper chamber maintains fluid level below check valve

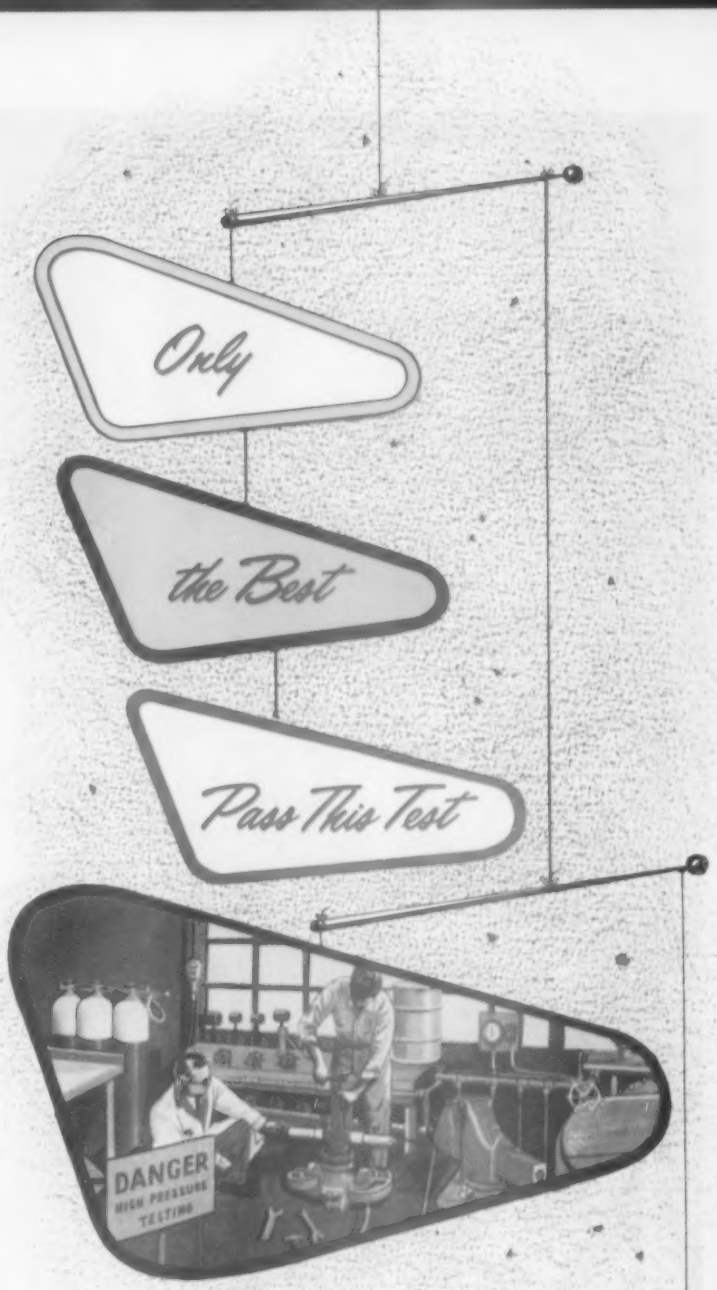
under normal low-pressure flow-line service. The plug-injection operation is performed with flow-line pressures under 100 psi., although the unit itself is rated much higher. *Well Controls, Inc.*

Check No. 7 On The Time-Saver Card

New Dual-String Packer Eliminates Extra Equipment

A new SOS detachable dual-string packer offers a number of operating advantages. With the dual-string packer each tubing string is run or pulled separately without the usual dual-string clamps and extra handling equipment, effecting a considerable saving in time and money. It permits permanent completion of lower zones with a full opening string with minimum or no tubing weight. The possibility of complicated fishing operations is eliminated. The detachable string packer is run in with one string, then the second string is run independently and automatically latches into and packs off in the packer

without rotation. A 45° concave surface at the top of the packer guides



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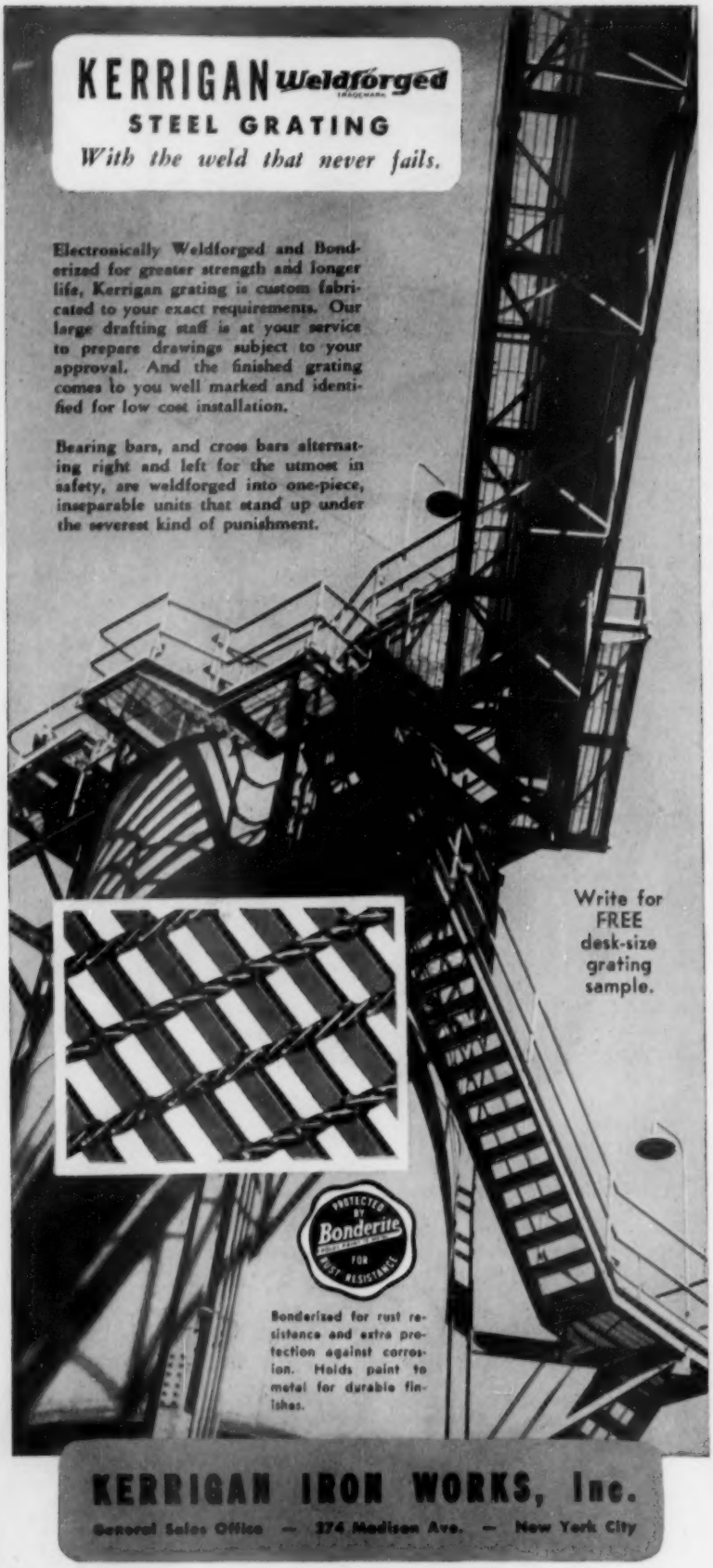
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the string into place and only right-hand rotation is required to release the string.

The advantages of dual-string installations include leaving mud in casing annulus with no pressure existing other than the hydrostatic head of the mud column. Both zones can be handled separately at all times so that they are never thrown together. Subsurface controls are installed in both strings so that they may be serviced separately. The operator is able to swab, treat, or pump either zone separately without interfering with production from the the other. *Brown Oil Tools, Inc.*

Check No. 8 On The Time-Saver Card

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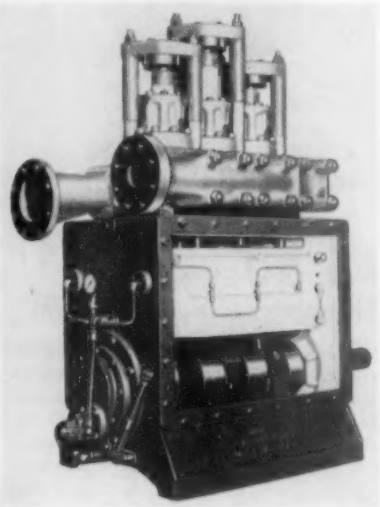

High-Volume Pumps Made For Injection Oil Recovery

A new series of high-pressure, high-volume pumps for oil recovery and industrial service features a vertical triplex design with a 5-in. stroke. Series TP-5000 pumps are available in 11 plunger sizes with a maximum capacity of 8,850 bbl. per day.

The vertical construction offers more hydraulic power per square inch of floor space; accessibility of sectionalized fluid end for ease in maintenance; and reduced wear on packings, crossheads, crosshead guides, plungers, and bushings.

Design features include solid ceramic plungers; double-roller main bearings; streamlined discharge manifold; self-adjusting packing; and 100 per cent pressure lubrication to crosshead guides, crosshead pin bearings, and crank pin bearings. Corrosion-resistant materials can be supplied at the user's specification.

These pumps run continuously in

maintaining hydraulic pressures in fluid injection for oil recovery. They also are recommended for cleaning condenser tubes, handling brines, wastes, solvents, acids, and alkalis. *Ajax Iron Works.*

Check No. 9 On The Time-Saver Card

●

Dopester Assures Better Thread Lubrication

The 4-0 Dopester provides simpler, positive, and more uniform thread lubrication, and is a new approach to the problem of assuring proper lubrication of drill-pipe threads. It is quicker, simpler, and less expensive to use than conventional hand-brush methods, and does a much more efficient job. It is also far simpler and more positive than mechanical thread-lubricating devices. It requires negligible maintenance and needs no hoses, no air supply, or other complicated accessory equipment.

The Dopester quickly pays for itself in the lubricant it saves. There is no waste, either in handling or in thread-dope application. The tapered applicator warrants a uniform grease coating in every thread top to bottom and all way around. The baffle keeps the lube bucket covered at all times. No dirt, mud, or other contaminants can reach the lubricant. A coating of grease can be accomplished by pressing the applicator into the baffle, and pressing it into the tool joint guarantees a uniform thread application. The sponge head and pressure plates are free to turn on applicator body so lubricant can be applied while tool joint is rotating, if desired. *E. W. Forrow Co.*

Check No. 10 On The Time-Saver Card

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"Buffalo" builds *anything* and *everything* you need in the fan and blower line. Big ventilating fans in our standard sizes deliver up to one half million cubic feet per minute, and more if required for special applications.

The smallest "Buffalo" Breezo Propeller Fan delivers as little as 500 cubic feet per minute and fans of this type range in size up to 144" diameter.

In between these two are Industrial Exhausters—Pressure Blowers—Mechanical Draft Fans—Electric Blowers—Exhausters—Axial Flow Fans — Belted Vent Sets — Baby Vent Fans — HVA Heating and Ventilating Units — all built to the high standards of the famous "Q" Factor* which has given "Buffalo" users more for their money for 78 years.

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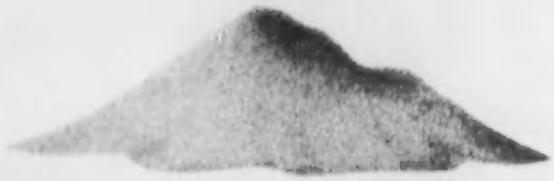
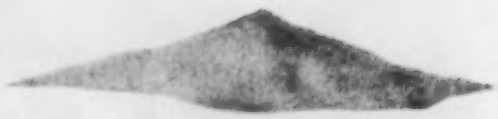


DOWN



SAND TROUBLES

IN STRIPPER WELLS

HARBISON-FISCHER

"TEXAS STRIPPER" ROD PUMP

This special stripper well pump is designed to prevent the plunger from becoming sand-locked during shut-down periods, and to pump wells with excessive trash and float sand. The discharge of the pump is completely enclosed by a long, reciprocating outer jacket tube which protects the plunger from being directly exposed to settling matter in the fluid column. During the pumping cycle, oil is discharged through ports in the pump barrel, into the jacket tube, and enters the fluid column near the bottom of the pump. The agitated action of the fluid thus discharged also keeps foreign substances in suspension, moving them upward and away from the pump.

Texas Stripper Rod Pumps are available in a wide range of barrel tube and plunger combinations to suit various depth and well characteristics . . . H-F Tuff-Temper, Precision, Flexite Ring, cup plungers, and composition ring plungers. For corrosive wells, Texas Stripper pumps also can be furnished with stainless steel or Monel parts. Illustrated bulletins giving full information on these and other Harbison-Fischer pumps are available without obligation through leading stores in all major producing areas, from our factory representatives, or by writing us at P.O. Box 127, Fort Worth, Texas.

They're NEW

- Bulletins
- Catalogs
- Brochures

for your copy, check ✓ ✓ the Time-Saver Cards.

New Safety-Equipment Catalog No. 55 is designed to give complete information on all Bullard safety products in a quick and efficient manner. On all pages clear photographs of the items being explained are shown along with easy-to-read technical data. The back page of the catalog lists all addresses and phone numbers of Bullard distributors. These distributors stock Bullard safety equipment for immediate shipment and their sales representatives are trained in industrial safety requirements. *E. D. Bullard Co.*

Check No. 11 On The Time-Saver Card

●

Custom Fabrication of Steel and Alloy Plate. New 48-page Catalog No. 554 describes, in words and pictures, the facilities and workscope of this large midwestern fabricator, and illustrates the latest techniques in the custom fabrication of steel and alloy plate. Particularly useful for reference purposes are the comprehensive corrosion-data tables for various metals. They list the corrosive action of 200 different chemicals in various concentration forms on 16 different metals. *Nooter Corp.*

Check No. 12 On The Time-Saver Card

●

Selection and Maintenance of Stainless-Steel Valves. Seventy-five questions and answers designed to help in the selection and maintenance of stainless-steel valves make up the body of this technical paper prepared from the quesions raised at valve clinics. The article covers selection of materials, data on new materials, service and installation problems, as well as information on valve repair. *Cooper Alloy Foundry Co.*

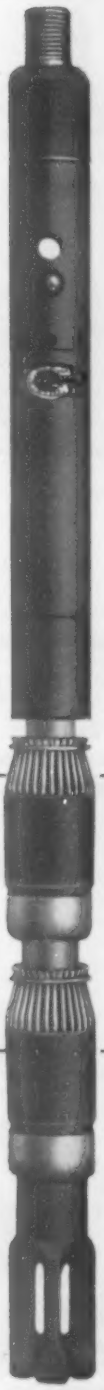
Check No. 13 On The Time-Saver Card

●

85 CFM Airmaster. A new, four-page bulletin illustrates and describes many exclusive features found on the 85 cu. ft. per minute Airmaster. A cross-section view of the one-unit engine-compressor design shows how the single cooling system, one lubrication system and one crankcase and crankshaft simplify any maintenance which might occur. Magneto ignition, replaceable wet-type cylinder sleeves, tight sealing

Get an OVERLOAD RELIEF VALVE

with your GUIBERSON TUBING SWAB

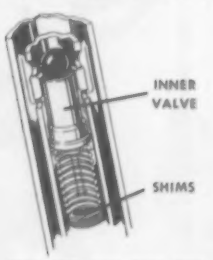


HEAVY DUTY TYPE SR RELIEF VALVE ON GUIBERSON TUBING SWAB

The Guiberson Overload Relief Valve will pay for itself many times over in preventing stuck swabs—in saving your wire line—because it automatically dumps excess fluid, lets you pull up the right amount of fluid for your swab job. It is well worth the slight extra cost.

The relief valve takes the place of the regular swab valve body and may easily be installed in the field on any Guiberson Tubing Swab. Valve is factory set to support a predetermined column of fluid and is responsive only to fluid pressure (fluid column) and not to line load. Parts subject to wear by high velocity fluid are corrosion resistant and long-lived.

For the best swab job—save your time and money with the Guiberson Tubing Swab. In 1½", 2", 2½", 2⅞", 3" and 3½" sizes, with cups for every size and purpose. Swabs also available for all drill pipe and casing sizes.



OVERLOAD RELIEF VALVE is easily adjusted in the field to support more or less fluid by changing number or thickness of shims under spring.

THE GUIBERSON CORPORATION

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THOMPSON *unitized* VACUUM TANKS for *MODERN* Refineries!

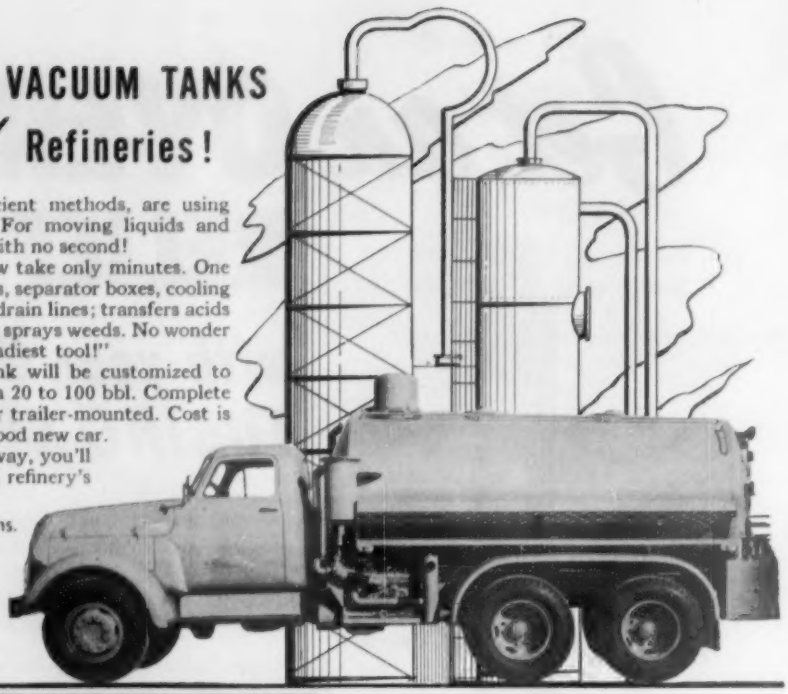
More and more refiners, seeking efficient methods, are using Thompson Unitized Vacuum Tanks. For moving liquids and semi-solids, they're first in the field—with no second!

Jobs which used to require hours now take only minutes. One driver-operator cleans tanks, drainboxes, separator boxes, cooling tower basins, spills, and leaks; unplugs drain lines; transfers acids and caustics; oils roads and tank bunds; sprays weeds. No wonder the Thompson UVT is called "the handiest tool!"

A Thompson Unitized Vacuum Tank will be customized to meet your needs. Capacities range from 20 to 100 bbl. Complete units can be skid, truck, semi-trailer or trailer-mounted. Cost is about what you'd expect to pay for a good new car.

If you are searching for tomorrow's way, you'll want to know more about the modern refinery's handiest tool.

Write today for complete specifications.



This is a 45-bbl. Thompson Unitized Vacuum Tank mounted on a GMC truck. This complete, mobile unit, operated by one man provides speed and economy for a host of liquid and semi-solid handling jobs at the world's most modern refinery.

New Model WT50 now available. A complete unit that can be truck-mounted in your own shop. Write for specifications.

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PHOENIX *Drop-Forged* FLANGES MEAN . . .

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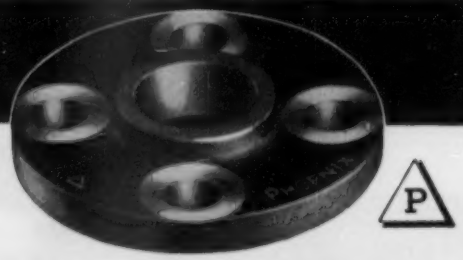

Long life is assured with Phoenix maximum strength flanges. Forged of mild steel, they are available in a wide range of styles and sizes. Meet ASA requirements and ASME and ASTM specifications.

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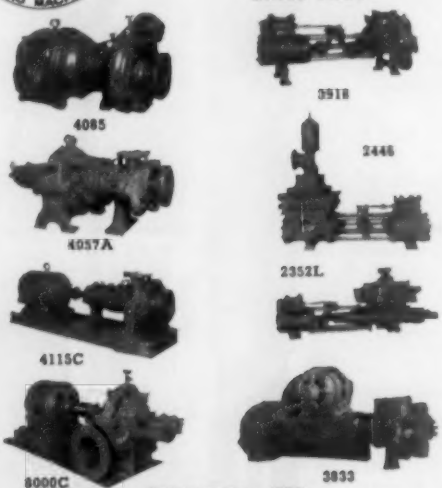

ESTABLISHED 1869

DEAN BROTHERS PUMPS INC.
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sides for tool and hose storage, and water-cooled manifold are other time-and-money-saving design points which are brought out. *Le Roi Division Westinghouse Air Brake Co.*

Check No. 14 On The Time-Saver Card

●

Fifteen Reasons for Dowell's Fast, Dependable Oil-Field Service, a four-page, two-color brochure illustrates 14 of the specialized vehicles for oil-field service needs. Illustrations include equipment for fracturing, acidizing, cementing, perforating, and logging. *Dowell Incorporated.*

Check No. 15 On The Time-Saver Card

●

Forged Steel Unions and Check Valves. This 24-page, 2-color catalog No. 55 presents specifications, construction, price, and capacity information on a selection of forged-steel unions in sizes from ⅛ to 3 in. and on check valves in sizes from 1 to 4 in. Both unions and check valves are available in trim materials to meet a variety of applications. *Clayton Mark & Co.*

Check No. 16 On The Time-Saver Card

●

Valves By P-K includes design principles, methods of operation, applications, and installation of control, bar stock, digester, and air and hose valves. Particular emphasis is given to the Paul venturi-ball valve principle. The brochure includes liquid-flow and throttling-characteristics charts. *P-K Industries, Inc.*

Check No. 17 On The Time-Saver Card

●

Pioneer Quick-Change Pistons, a four-page brochure covers the economic and operating advantages gained by eliminating the necessity of pulling rods. Step-by-step illustrations show this new method of piston changing. Also illustrated is the Pioneer piston puller and hydraulic pump. *Pioneer Specialties, Inc.*

Check No. 18 On The Time-Saver Card

●

Titanium, New Member of the Family of Metals. Tubing of titanium is described in Bulletin 43. The eight-page bulletin presents the most up-to-date information on the fabrication of unalloyed titanium tubing. Subjects covered include heat treating, pickeling, welding, brazing, and machining. The section of applications for titanium tubing includes illustrations of an absorption tube for use on a microanalytical train, autoclave cooling coils and the head of a laboratory autoclave fabricated entirely from titanium, including titanium tubing. The advantages of titanium include lightweight, high strength, high strength, high ratio of fatigue limit to tensile range, low-linear coefficient of expansion, corrosion resistance, good ductility, formability, and heat resistance. *Superior Tube Co.*

Check No. 19 On The Time-Saver Card

●

Comprehensive Perforated Metals Catalog. A liberally illustrated new 114-page catalog is pocket-size and spiral-bound for easy reference, and contains a wealth of useful information about perforated metal. The greatest number of pages are devoted to well-organized, actual-size illustrations of perforated metal samples. In addition, space is devoted to helpful buying information, the end uses of perforated metal and manufacturing processes. *Standard Stamping & Perforating Co.*

Check No. 20 On The Time-Saver Card

●

High - and-Low - Pressure Strainers for Oil, Water, Steam, Chemicals. SK Bulletin 9-S includes information on 15 types of strainers for high-and-low-pressure service. This bulletin contains 16 pages of dimension and sizing charts, sectional drawings, and descriptive information on strainers. It discusses application, design features, and specific

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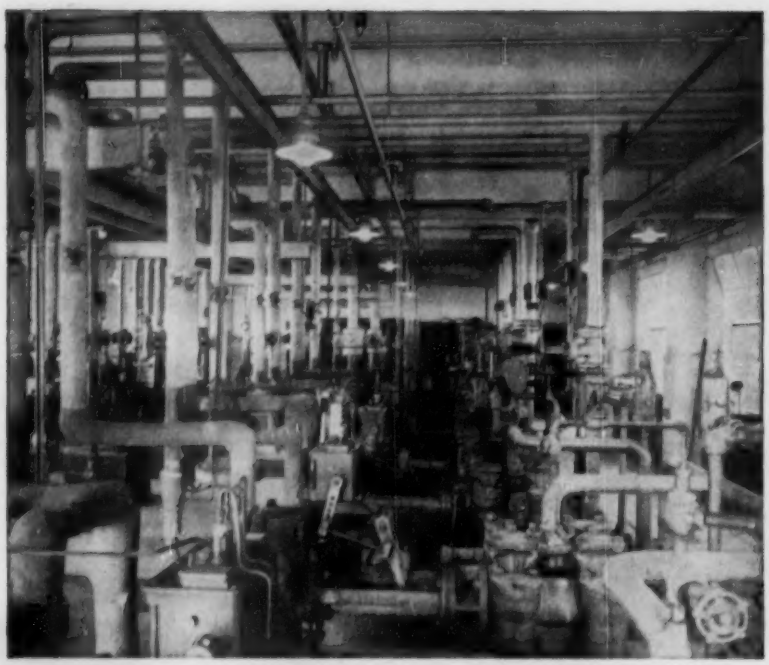

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Close inspection reveals much more than meets the eye in this petroleum refinery pump room. "Automatic" FIRE-FOG protection, ENGINEERED to this specific risk, is ready at all times to detect and extinguish fire, should it threaten to destroy property, halt production, reduce profits.

This is but one type of a wide variety of fire-fighting systems designed, manufactured and installed by "Automatic" Sprinkler Corp. of America. Others employing AIR FOAM, high or low pressure CO_2, Dry Powder, etc. stand guard over scores of petroleum and petro-chemical properties throughout the world.

The time to plan ENGINEERED "Automatic" FIRE PROTECTION is **before** fire strikes—not **after** fire has destroyed. Contact your nearest "Automatic" Sprinkler fire protection engineer for an appointment with a Safety First future. He'll gladly prepare a fire protection analysis for you without cost or obligation.

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operating characteristics and is a handy reference book for engineers, process designers, and maintenance men. *Schutte & Koerting Co.*

Check No. 21 On The Time-Saver Card

●

Pressure Pilot. A four-page booklet contains complete information on the new pressure pilot. This instrument is compact, and is completely self-contained. A 3½-in. precision-process pressure gage is incorporated in the instrument eliminating the need for a separate gage. A single knob and index indicator provide direct set of control point. Screwdriver adjustment permits adjustment of proportional band from 2 to 100 per cent; change from direct to reverse action, and from proportional to differential gap control. These features and operation are described in the text; interior and exterior construction are illustrated by captioned photographs. *United States Gauge, Division of American Machine & Metals, Inc.*

Check No. 22 On The Time-Saver Card

●

Redesigned Ramsbottom Carbon-Residue Apparatus. Data Sheet No. 11314 describes redesigned Ramsbottom carbon-residue apparatus, an instrument for the determination of the amount of carbon residue left after evaporation and pyrolysis of an oil. The data sheet discusses applications of the apparatus, as well as the outstanding features such as temperature control, accuracy, construction, and wiring. *Precision Scientific Co.*

Check No. 23 On The Time-Saver Card

●

G. P. & F. Steel Shipping Containers. In addition to containing illustrations of all containers for petroleum and chemical industries, the catalog gives specifications and carload quantities of each product. Also included are illustrations and descriptions of the various types of spouts available for use with G. P. & F. pouring pails and tight-head drums. *Geuder, Paeschke & Frey Co.*

Check No. 24 On The Time-Saver Card

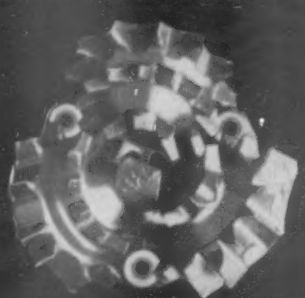
●

Soil-Testing Equipment. A new 104-page catalog contains descriptions and illustrations of over 1,250 items of apparatus for engineering tests of soils, concrete, asphalt, and construction materials. The catalog has an extensive section devoted to soil-mechanics apparatus from the basic-sampling and preparation equipment to the actual testing machines for triaxial, unconfined compression, direct shear, bearing ratio, consolidation, and similar tests. *Soiltest, Inc.*

Check No. 25 On The Time-Saver Card

GLOBE'S *New* "3 CUTTER" JET ROCK BIT

Thoroughly Tested and Proved Before Being Put On the Market, the Globe "3-Cutter" Offers a New Standard for Rock Bit Performance



Working in full cooperation with the men in the rig who actually run the bit, Globe engineers gave the new "3-Cutter" a thorough going over . . . digging in all type formations . . . at all depths with full load. Performance of the New Globe "3-Cutter" *is the greatest!* . . . SETTING AN ENTIRELY NEW STANDARD. We KNOW that you'll agree.

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EQUIPMENT MEN . . . in the News

Directo Corp. Announces Key Staff Changes

R. R. NUNN

R. R. (Bob) Nunn has been promoted by Directo Corp., Houston, to the position of division manager. Terrell Allen, Jr., has recently joined Directo as field service representative in West Texas-New Mexico division, and Rex H. Fordyce has been assigned to new duties with Directo as project engineer.

T. ALLEN

R. H. FORDYCE

Nunn was sales representative for Directo's hydraulic drilling tools in the West Texas-New Mexico area prior to his new appointment. His new duties are expanded to include field supervision of operations and service, as well as marketing of Directo products. Allen will render direct field service in Directo's mud-activated drilling tools, as well as coordinate with the development laboratories in Houston. Prior to his assignment with Directo, Allen was field representative of Core Laboratories. Fordyce formerly served with Cameron Iron Works in an engineering capacity.

Ideco Representatives See New Mayhew Portable Rig

Ideco Sales representatives and technical service men inspected the new Mayhew Model 3000 portable rotary drilling rig at Mayhew's Dallas plant. Ideco is exclusive export distributor for Mayhew equipment. Eighth from left is Gordon Strudwick of Woodfield Hoist in Rochester, Kent, England. Woodfield is an Ideco-affiliated organization which manufactures drilling, workover, and servicing equipment in England. The representatives pictured are: J. K. Hudgens, R. M. Perdue, M. E. Horn, J. B. Hartzog, L. R. Spencer, J. R. Hilder, Bill Phillips, Strudwick, R. A. Feemster, G. G. Wilbur, E. F. Shields, C. F. Van Loozen, C. S. White, Horace Branham, M. R. Armstrong, W. K. Thorson, W. J. Mallin, S. H. Barrett, Clyde Boss, and A. M. Blevins.

Barton Instrument Shifts Three to Key Positions

C. B. NOLTE

Barton Instrument Corp. has announced the promotion of Claude B. Nolte to vice president in charge of manufacturing. A. I. Thompson has been advanced to the position of sales manager, and T. L. Davia has been named office manager in charge of sales department.

Nolte has been working for Fluor Corp. to become head of the instrument department from 1942 through 1946. He joined Barton in 1946 and was appointed vice president in charge of sales in 1949. Thompson has been working for Bristol Co. as sales and development engineer from 1937 through 1950. He joined Barton in 1950 to take position as assistant sales manager. Davia started with Barton in 1952 as junior engineer.

George Conner Joins Milwhite Sales Staff

George Conner has joined the sales organization of Milwhite Mud Sales Co., Houston. Before joining Milwhite, Conner was with Garrett Oil Tools for more than 6 years. He served first in the Louisiana-Mississippi area, then moved to Odessa, Tex., for 3 years, acting as division manager of that area. He covered the Rocky Mountain region from Billings, Mont., to Farmington, N. M., and also went into the southern part of Mexico on work for Petroleos Mexicanos.

He was transferred to Houston in 1953 as city sales representative for Garrett, a position he held until becoming associated with Milwhite.

Houston Nomads Honor Past Presidents

The Houston chapter of Nomads was host to nearly 300 members and guests on December 13 at the Houston Country Club, at a dinner, honoring the past presidents of the organization. Governor Dan Thornton of Colorado was guest speaker. Seated at the head table above, are: Mike Halbouty, independent oil operator; George Strake, independent oil operator; Governor Thornton; R. K. Franklin, Rolo Manufacturing Co., and president of the Houston chapter; W. W. Flenniken, president Rocky Mountain Oil and Gas Association; and Rex G. Hamaker, president Reed Roller Bit Co.

Mossman, Baum Promoted by Seismograph Service Corp.

R. W. Mossman and R. B. Baum have been elected assistant vice presidents of Seismograph Service Corp., it

R. W. MOSSMAN

R. B. BAUM

has been announced by Gerald H. Westby, S.S.C. president. Mossman will be in charge of northern division of the company's domestic exploration program and Baum will head the southern unit.

Mossman was associated with Oklahoma Geological Survey from 1935 to 1936, and was with Geophysical Research Corp. during 1936 and 1937. He joined Seismograph as a trainee computer in 1939 and was made party chief in 1942. He was named supervisor in 1944 and then in 1952 became chief geophysicist following a short term of duty in Chile.

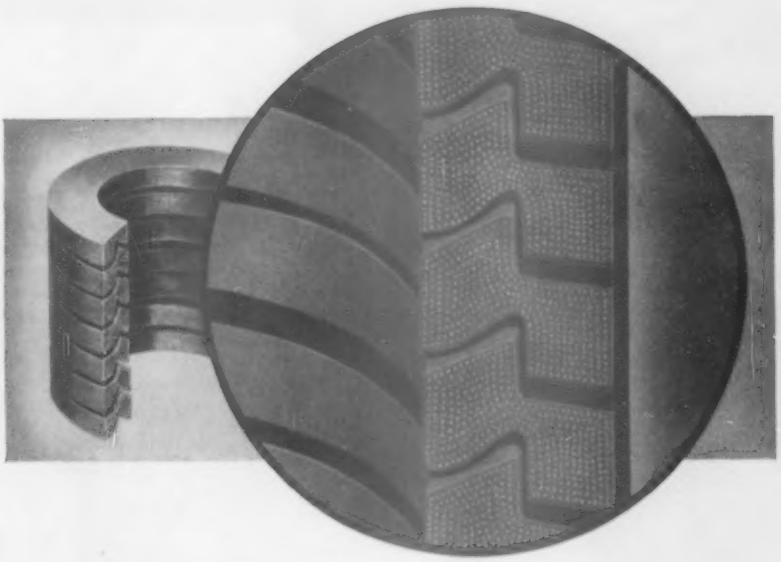
Baum's seismic experience includes work offshore Canada, offshore East Coast, in Illinois, Indiana, the Mid-Continent area, West Texas, and the Gulf Coast. He was supervisor and district manager in charge of S.S.C.'s Shreveport, La., office before his new appointment.

Dowell Shifts Three to Field-Development Group

Increased field operations have made it necessary for Dowell Incorporated to transfer three field engineers to the company's general-office, field-development group in Tulsa, according to A. C. Polk, vice president and general manager.

The men are: J. L. Trittipo, formerly station manager at Belle, W. Va.; J. K. Crane, formerly district engineer at Salem, Ill.; and V. W. Grotlisch, formerly sales engineer at Chicago Heights, Ill. Each will carry the title of development engineer. They will work under J. Keller Henderson, chief field engineer, on the application and perfection of newly developed techniques and services in the field.

Trittipo joined Dowell at Pittsburgh, Pa., in 1951. Since then he has served Dowell as service engineer and station manager at Belle. Crane has been with Dowell since 1949. In 1952 he was promoted from service engineer to pe-



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R/M "Vee-Square" mud pump packings have no equal for heavy duty service. Unlike ordinary V-ring packings, they do not need any sensitive gland adjustments. The solid square section absorbs gland pressure and keeps the packing from rolling and riding the rod. The V-design assures automatic sealing; the soft rubber cushion between the rings prevents blow-by. For more effective sealing and greater rod protection, use R/M "Vee-Square" packings. * Patent Pending

If lowering your rod costs interests you, write today for our booklet showing pumps for which "Vee-Square" is available and sizes in which it is made.

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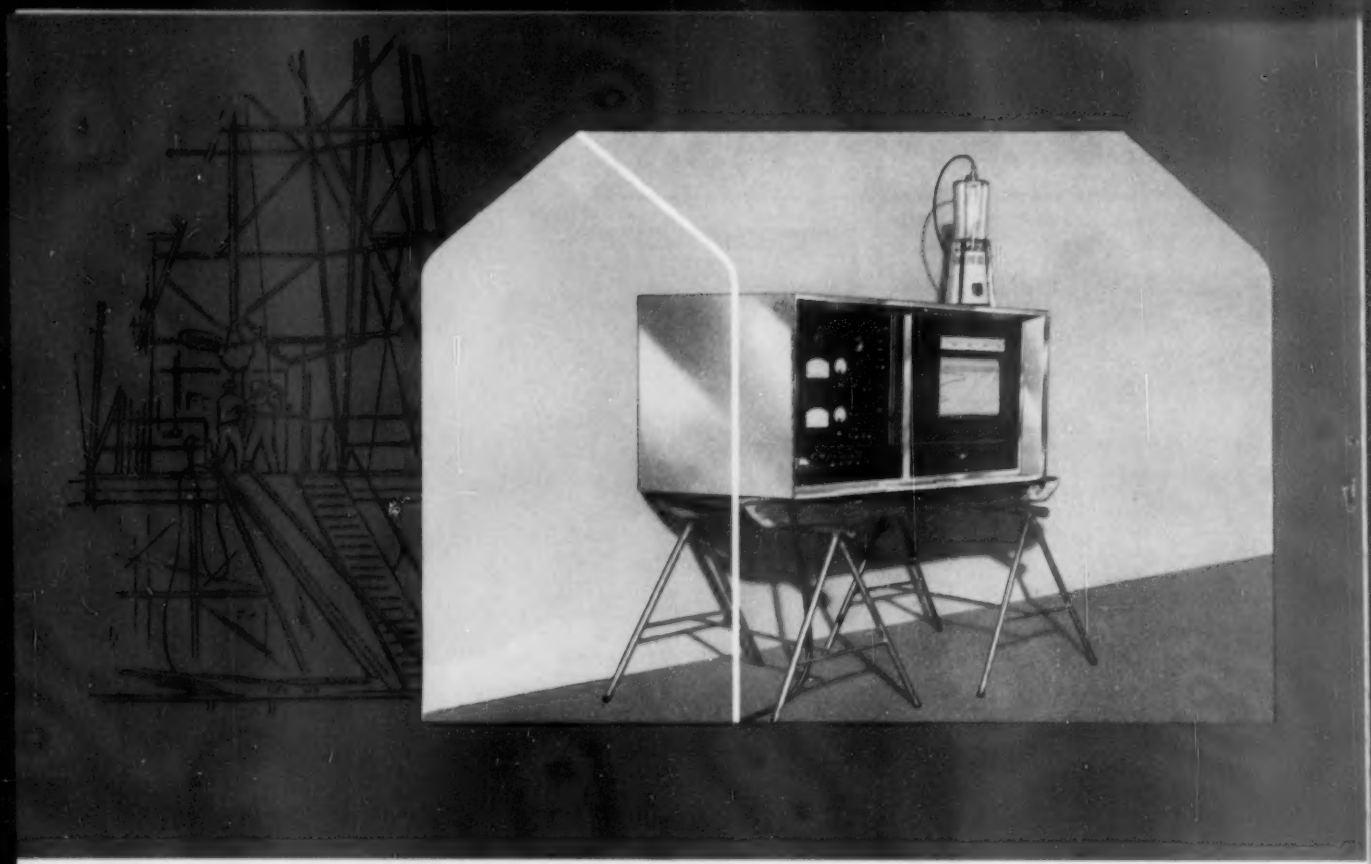

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Now field-tested and available to you: a portable recording gas detector incorporating the principles made famous by Baroid's mud and cuttings analysis Well Logging Service. Your own field geologist can use it at any well to determine coring points, help interpret electrical logs, pinpoint zones to perforate or DST, and to warn against possible blowouts.

Use it at field wells, isolated or offshore wells, or wherever use of the truck-mounted Baroid Well Logging Service is not justified economically. Use it to continuously, automatically detect and record gas zones penetrated by the bit, or use it for gas determination of batches of cuttings samples.

Readily installed at well site or in geologist's field trailer or sample house. Size is only 4' by 2' by 1½'; weighs 350 lbs., uses only 300 watts of 115 volt power, AC or DC. Write today for brochure giving full details and prices.

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troleum engineer and in 1953 he became district engineer at Salem, a position he held until his transfer to Tulsa. Grotlisch joined Dowell in March 1953 as a junior service engineer in Dowell's industrial division at Chicago. He has also filled the positions of service engineer and sales engineer.

Cardinal Chemical Makes Two Key Promotions

Cardinal Chemical, Inc., has announced two key promotions. One is that of George W. Radney, former

G. W. RADNEY

K. W. MASSEY

Odessa, Tex., station manager, now attached to the Odessa district as sales and development engineer. The other is that of Kenneth W. Massey, former Odessa treating engineer, who replaces Radney as Odessa station manager.

Cardinal maintains stations and offices at Odessa, Midland, and Levelland, Tex., and Hobbs, N. M. Home offices are located in Dallas.

McWilliams Takes Key Job With Republic Supply Co.

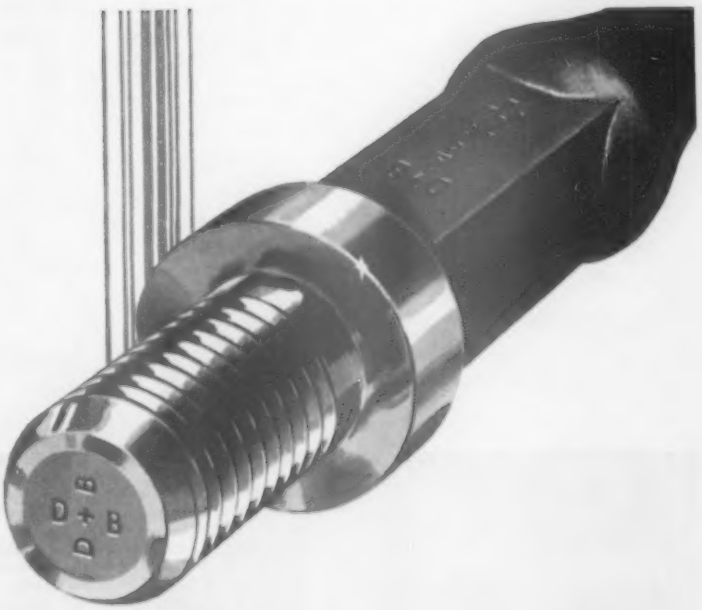
W. J. McWilliams, government and industrial administrative expert, has been named assistant to the president and secretary of Republic Supply Co., according to James E. Webb, president of the company.

McWilliams will handle the corporate records of the company and act as personnel director and manager of office service, serving in the company headquarters at Oklahoma City.

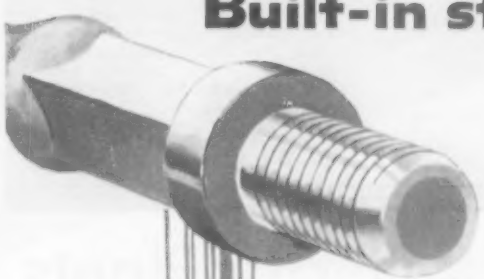
Southwest Supply Makes Brown District Manager

E. E. BROWN

The appointment of E. E. Brown as district sales manager for the Shreveport, La., area has been announced by John A. Bell, Jr., president of the Southwest Supply Co., Pittsburgh. Brown's territory will embrace all of Louisiana, Arkansas, Mississippi, and a portion of East Texas. The Shreveport office is part



Built-in strength



D+B Sucker Rods are built stronger . . . to last longer. They give you the right combination of strength, ductility and impact resistance. Selection of quality steel, true full-length normalizing and drawing, and accurate manufacturing controls assure this fact.

D+B Sucker Rods are available for every pumping condition: Type 5, Heatreat #1 CM, Reliance, Hi-Ten. Select now from complete stocks at your nearest D+B or CONTINENTAL store.

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of Southwest Supply's Tulsa division which is under the supervision of Shep Miers, vice president.

Before joining Southwest Supply on January 1, 1955, Brown had served in various capacities in Texas, Arkansas, and Louisiana with Republic Supply Co., and resigned the position of assistant district manager at Shreveport to join Southwest Supply.

Dowell Acquires Control of Latin-American Firm

Dowell Incorporated has recently acquired controlling interest in United Oilwell Service, S. A., an important oil-field service company in South America. Dowell purchased the interests of Herbert Hoover, Jr., now Under Secretary of State. Hoover was formerly president of United Oilwell Service. Operation of United Oilwell will be under the direction of the executive committee, shown above. They are Lester Swan, Houston, executive vice president of Brazos Oil & Gas Co.; A. A. Curtice, New York petroleum consultant; John G. Staudt, executive vice president of Dowell, and chairman of United Oilwell's executive committee; E. A. Pielemeier, Pasadena, Calif., vice president of United Geophysical Co., and secretary and comptroller of United Oilwell's executive committee; and Tromer R. Smith, Caracas, Venezuela, general manager of United Oilwell Service. The concern will operate as a subsidiary of Dowell and will perform the same services in South America as the parent company does in the United States. United Oilwell operates in Venezuela and Columbia, has service headquarters at Maracaibo, Anaco, and Tigre, Venezuela, and operates hydrochloric acid plants at Mara and Anaco, Venezuela. General offices are at Caracas.

Worthington Makes Meiter General Sales Manager

W. A. MEITER

William A. Meiter, central sales manager of Worthington Corp., has been promoted to general sales manager, it has been revealed by Thomas J. Kehane. Meiter will succeed Kehane who has been appointed vice president in charge of sales, as previously announced.

Meiter joined a Worthington training class in 1927. He served as sales engineer in the Cleveland sales office and in 1938 was named manager of the Buffalo, N. Y., district sales office. In 1950 he became central sales manager. He will make his headquarters at Worthington's executive offices at Harrison, N. J.

Southwestern Plastic Pipe Opens New Facilities

New, expanded facilities for Southwestern Plastic Pipe Co., division of Texas Vitrified Pipe Co., were scheduled for completion early in January, according to E. W. Hendrick, manager of Mineral Wells, Texas firm. The new addition will more than double Southwestern's present manufacturing and warehousing facilities.

Hendrick stated that the additional

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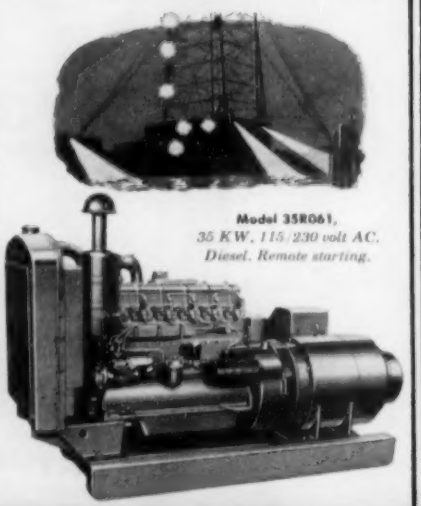

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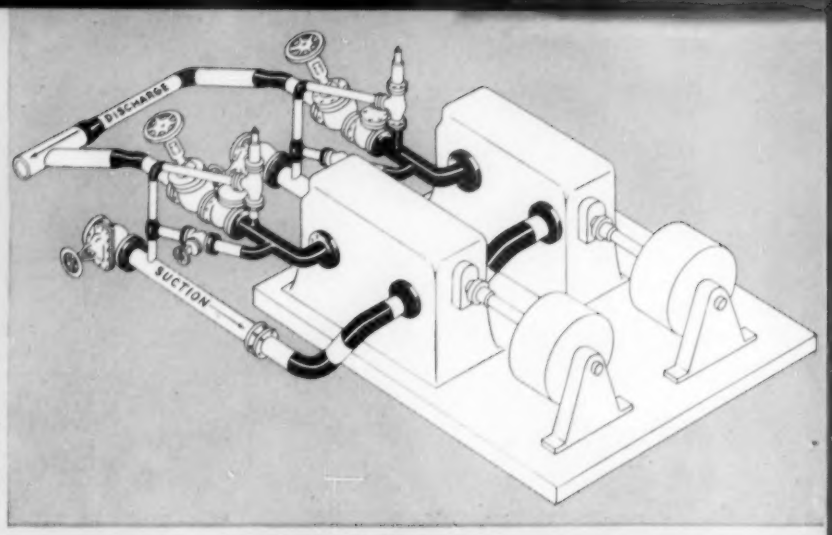

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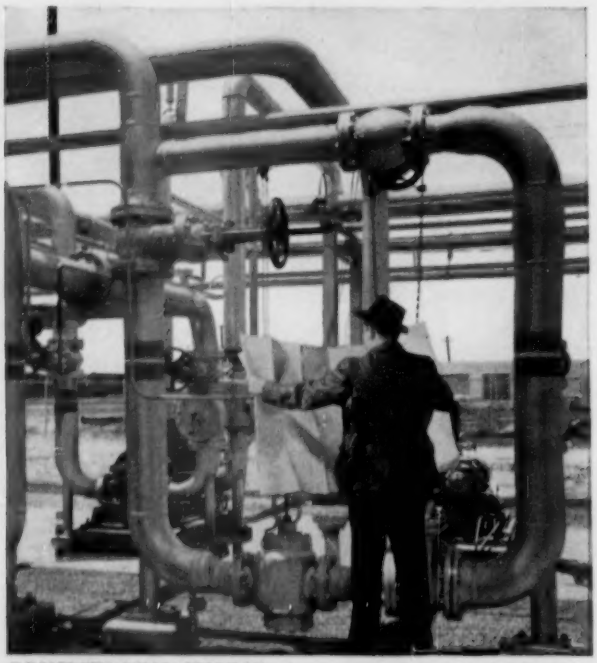

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space will enable the firm to maintain complete stocks of standard sizes in all types of Southwestern pipes. The firm extrudes Kralastic, Tenite, polyvinyl-chloride (P.V.C.), and polyethylene plastic pipe.

Leschen Relocates Los Angeles Facilities

A move to 6424 East Fleet St. in Los Angeles by Leschen Wire Rope Division of H. K. Porter Co., Inc., has been announced by D. G. Berglund, district manager.

The new location will house both the warehouse and sales office. It is served by a rail siding and has ample space to store and handle efficiently the varied stock of Hercules wire rope required by industry in the Los Angeles area.

Pacific Forge Announces Construction of New Plant

Pacific Forge, Inc., a subsidiary of Pacific Valves, Inc., has awarded J. B. Gill Co., of Long Beach, Calif., with a contract for engineering and construction of a million dollar forge plant in South Fontana, Calif.

Pacific Valve is a large manufacturer of steel valves. It is supplied with forging by Pacific Forge. Production of forgings is scheduled to begin shortly after January 15.

Chicago Bridge & Iron to Distribute Microballoons

Chicago Bridge & Iron Co. has been appointed as a distributor of Microballoons, it has been announced by C. W. Blount, vice president in charge of sales for Bakelite Co., a division of Union Carbide & Carbon Corp.

Microballoons are microscopic spheres of Bakelite phenolic resin which, when added to crude oil, float as a thin layer on top and aid in reducing evaporation losses.

According to Fred L. Goldsby, vice president and general sales manager, Chicago Bridge & Iron will concentrate its marketing activities for the present on those situations in the petroleum industry to which the use of this new material is particularly suitable.

These tiny hollow particles are being sold under Standard Oil Co.'s trademark Microballoons. This company developed them as an evaporation barrier for crude-oil storage. Resembling particles of a finely ground, dark flour in bulk consistency, Microballoons look like brown ping-pong balls under the microscope. Each Microballoon is filled with inert nitrogen gas sealed-in by thin walls of Bakelite phenolic plastic.

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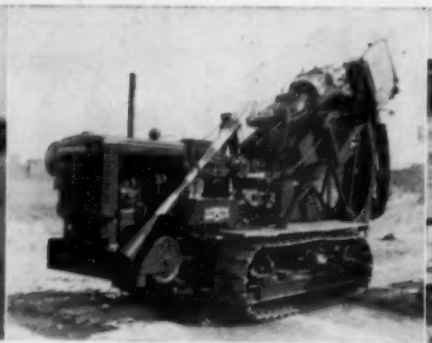
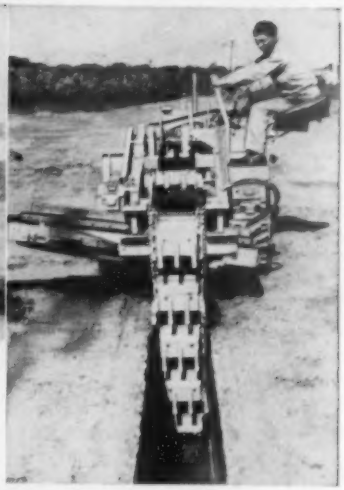


Cleveland Trencher, Model 240, manufactured by The Cleveland Trencher Co., Cleveland, Ohio



Universal Trencher manufactured by Heller Engineering & Mfg. Co., Lynwood, Calif.

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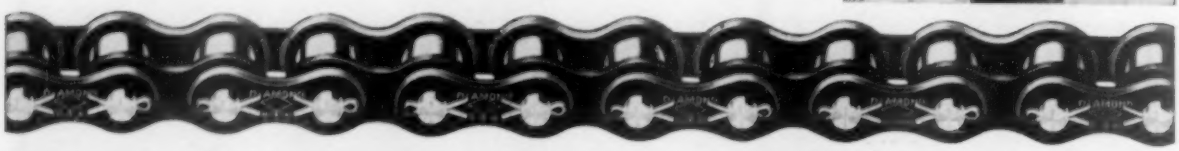

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EXPLORATION

San Juan Basin Poised for Banner Year

by Frank J. Gardner

IT'S hard to visualize gas—much less 12 trillion cubic feet of it. But most oil men can easily visualize barrels. Take, if you will, the proved gas reserve of the San Juan gas area, and reduce it to its equivalent in barrels of liquids. Using the B.t.u. basis of 6,000 cu. ft. per barrel, you'll come up with a neat 2 billion barrels.

The phenomenal expansion of the San Juan area was one of the top exploration stories on the domestic scene in 1954. From a relatively obscure position in 1950, this sprawling region has captured the attention and imagination of the entire oil industry as its vast reserves of gas have become apparent.

While drilling was down a bit during 1954, in terms of wells completed, the year typified San Juan's pattern of growth—**outward** in every direction as drillers felt with subsurface fingers for the edges of the basin and the anticipated wedgeouts of the Cretaceous producing sands.

Here is the heartbeat of the year's biggest industry battle—the fight for the right to transport this gas to the Pacific Northwest. Now that the fight has been settled amicably and to the best interests of all concerned, the field is in for an even greater drilling campaign in 1955.

How big will it be? Nobody knows. Already, it's the third largest gas field in the country. It covers some 800,000 acres, and is known to contain at least 12 trillion cubic feet of gas.

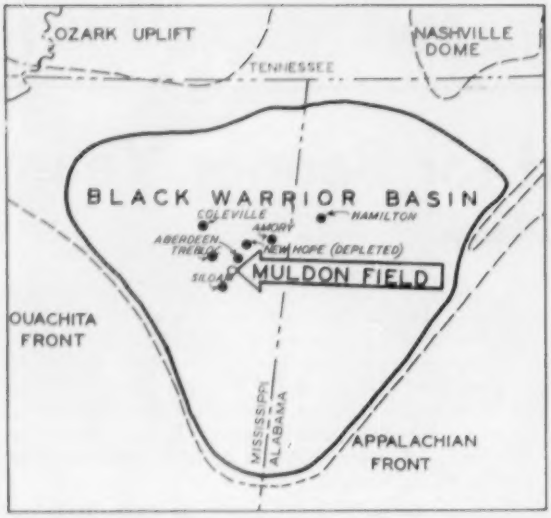
It is likely that 1955 will see continued expansion on all sides of the field, and there's plenty of room for it. The semicircle of small oil fields near the bottom of the map are close to the basin perimeter—the land between them and the gas field proper is not condemned. Even more important is the prospect of oil reservoirs around the basin rim, and in the deeper formations basinwide. To date, only one field (Hutchinson) is producing Jurassic oil, but it is a sign of things to come. Pre-Cretaceous rocks are essentially untested throughout the basin, and they hold great promise of both oil and gas for the future.

The important happenings of 1954 rested with the 27 wells tabulated here and keyed to the map. Briefly, the greater discovery honors are concentrated in only a few of the 27 as follows: at 10, the longest stepout; at 19, a Hospah discovery; at 9, a Torreon-Puerco strike (completely unexpected heretofore); at 13, encouraging but noncommercial showings in the Morrison-Jurassic; at 22, good new Mesaverde strikes; at 24, 25, and 26, Fruitland and Dakota discoveries; and at 27, a significant new well in the Pictured Cliffs which opens great new areas to prospective production.

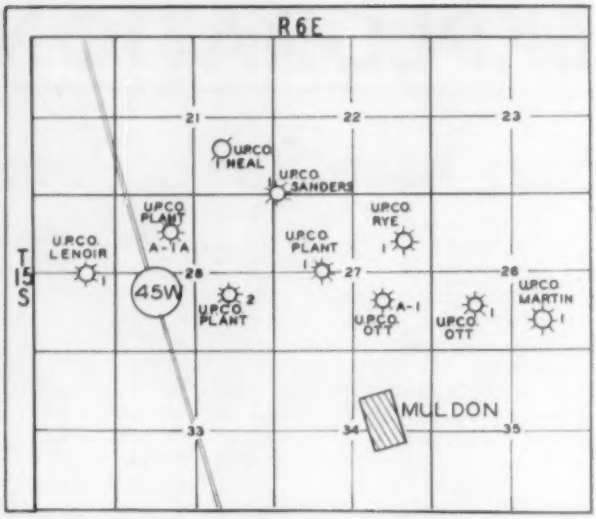
There is a great deal yet to be learned of San Juan. There is a great deal to be expected. Geological study and drilling will tell the story. Money, knowledge, and nerve are the only essentials to the search.

Outward expansion on all sides increased the promise of the San Juan gas field during 1954. The 27 numbered wells are the most important extensions.

1. Phillips Petroleum Co. 1 Indian "E," 31-29n-3w. Pictured Cliffs (Gas).
2. El Paso 3 San Juan Unit 27-4, 15-27n-4w. Mesaverde (Gas).
3. Southern Union 1-"E" Jicarilla, 16-26n-4w. Pictured Cliffs (Gas). Southern Union and Aztec Oil & Gas 2-A Jicarilla, 14-26n-4w. Pictured Cliffs (Gas).
4. Southern Union Gas Co. 1 "F" Jicarilla, 27-26n-4w. Pictured Cliffs (Gas).
5. Southern Union 1-"D" Jicarilla, 32-26n-3w. Pictured Cliffs (Gas).
6. Southern Union 1-"G" Jicarilla, 1-26n-5w. Mesaverde (Gas).
7. Continental Oil Co. 2 Jicarilla, 20-25n-4w. Pictured Cliffs (Gas).
8. Magnolia Petroleum Co. 4 Ingwersen-Federal, 20-24n-2w. Entrada (Oil).
9. Magnolia 1 Schmitz, 34-24n-1w. Torreon Puerco (Gas).
10. Humble Oil & Refining Co. 1 Jicarilla, 15-23n-5w. Dakota (Gas-distillate).
11. Stanolind 1 Jicarilla, 30-26n-5w. Pictured Cliffs (Gas). Stanolind 2 Jicarilla, 30-26n-5w. Pictured Cliffs (Gas).
12. Superior Oil Co. 1-7 Sealy-Government, 7-25n-6w. Pictured Cliffs (Gas).
13. R. A. Johnston 31 Rincon Unit, 36-27n-7w. Pictured Cliffs (Gas).
14. Bolack Oil & Gas Co.-Benson & Montin 1 Sheets, 12-25n-8w. Pictured Cliffs (Gas).
15. Benson & Montin 1 Quitzau, 3-25n-8w. Pictured Cliffs (Gas).
16. Benson & Montin 1 Texas-Navajo, 5-25n-8w. Pictured Cliffs (Gas).
17. Benson & Montin 1 McManus, 30-26n-8w. Pictured Cliffs (Gas).
18. Benson & Montin 1 Wilson, 32-26n-8w. Pictured Cliffs (Gas).
19. Skelly Oil Co. 1 Navajo "B," 14-26n-12w. Hospah (Gas).
20. Stanolind Oil & Gas Co. 13 USG, 19-29n-16w. Pennsylvanian (Oil, gas).
21. Lucille H. Pipkin 1 Pipkin, 31-30n-14w. Pictured Cliffs (Gas).
22. Pubco Development Co. 1 Russell-Federal, 4-29n-14w. Mesaverde (Gas).
23. Pubco 2 Russell-Federal, 33-30n-14w. Pictured Cliffs (Gas).
24. Pubco 1 Ute Indian, 9-33n-9w. Fruitland (Gas).
25. U. S. Smelting, Refining & Mining Co. 1-X Arvil Brown, 15-33n-9w. Dakota (Gas).
26. U. S. Smelting 1-21 South Ute, 21-33n-9w. Fruitland (Gas).
27. Stanolind 1 Bixler Gas Unit, 14-32n-6w. Pictured Cliffs (Gas).



LOCATED near the center of the Black Warrior basin of Mississippi and Alabama, Muldon is the basin's most active field. Fig. 1.



DEVELOPMENT in Muldon field is concentrated north of the town of Muldon. Union Development Co. drilled all completed wells. Fig. 2.

Here's the first complete report on . . .

Muldon: Where Black Warrior Pays Off

by Wilbur H. Knight

Today only Muldon field—of the nine that received so much play in 1953—stands out as a successful, growing development. Difficult drilling and poor returns discouraged operators in other fields, but Muldon pays off. This report tells why.

THE discovery of Muldon field, late in 1951, signaled the start of an intensive leasing, geophysical, and drilling program by many major oil companies throughout most of the Black Warrior basin. Prior to the Muldon discovery, exploration for oil and gas in this area had been, with few notable exceptions, carried on by small independent operators. Their sporadic efforts were commercially unsuccessful except for Amory field. But the information obtained from the several score dry holes has contributed immeasurably to present-day knowledge of the geology of Black Warrior basin.

Amory field, located 20 miles northeast of Muldon field, was discovered in October 1926. This small field produced an estimated total of 1,500 M.M.c.f. of gas before abandonment early in 1938. Vestal[1] has described in considerable detail the economic geology of Amory field and surrounding area.

Muldon field is located slightly west of the geographical center of the Black Warrior basin (Fig. 1), and 10 miles southwest of Aberdeen, Miss., the county seat of Monroe County.

The geology of the basin has been very capably presented by Mellen.[2] The comparatively large amount of subsurface data which has become available since the publication of Mellen's work has added only geologic details which attest to the fundamental correctness of his broad descriptions.

History of Muldon Area Prior to Discovery

During the early part of 1941, Carter Oil Co. assembled several lease blocks in Monroe, Clay, and Chickasaw counties, Mississippi. These blocks were taken in areas which were mapped by Carter's reflection seismograph as structurally favorable. The Muldon area was one of these lease blocks.

Between July and November 1941, Carter Oil Co. 1 Sanders (22-15s-6e) was drilled in the Muldon area. This well was abandoned as a dry hole at a total depth of 6,059 ft. in the upper part of the Iowan. The electrical log of this well, made prior to its abandonment, is reported as part of Fig. 3. No drill-stem or production tests were made of the 1 Sanders well. Carter dropped all its leases in the Muldon area as rentals fell due in 1942.

Some time after Carter plugged the 1 Sanders, it was noted by several local residents that a very small volume of gas was escaping from the well. This fact was well known in the immediate area and to many oil scouts. It was apparently regarded by most with only passing interest. However, J. T. Sanders, on whose land the well was located, together with several other local persons who believed the Muldon area held promise of commercial production, reassembled the old Carter lease block during 1951.

Discovery

Northeast Mississippi Oil Co. — a small company owned principally by Howard A. Nason, Malcolm McCaskill, and Charles McCamic — was formed for the purpose of acquiring

Author is district geologist, Union Producing Co., Jackson, Miss. This paper was first presented before the Mississippi Academy of Science in April 1953; later development in Muldon field afforded considerable new data, and this expanded review of the field history was presented before the fourth annual meeting of the Gulf Coast Association of Geological Societies in Houston, November 1954. Paper is published by permission of the Union Producing Co. and the G.C.A.G.S.

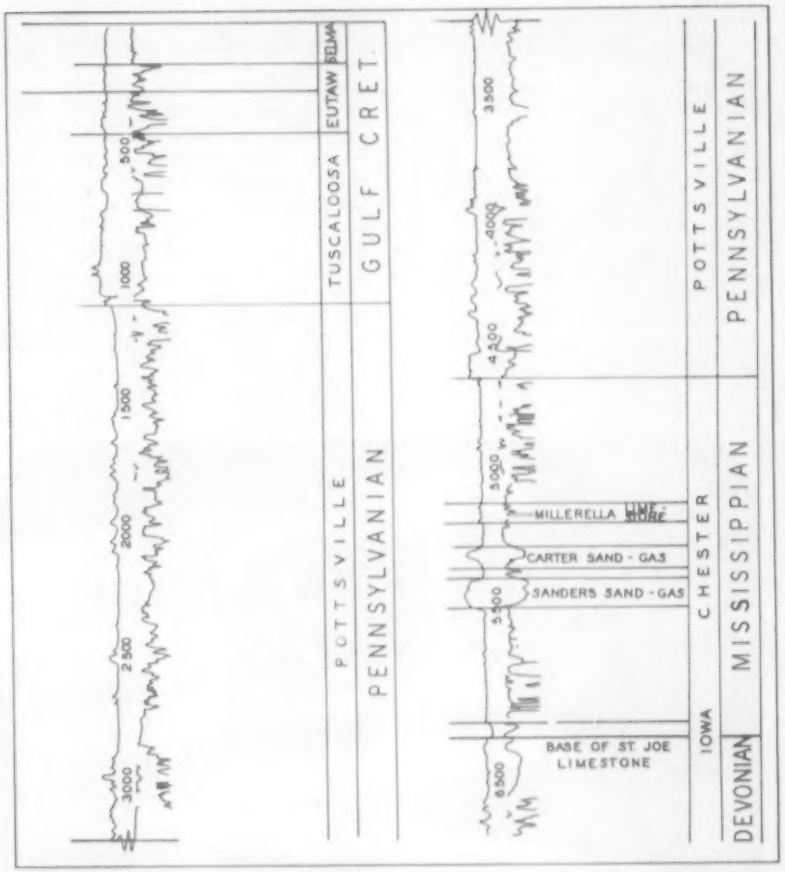
the Muldon lease block from Sanders et al. and cleaning out the old 1 Sanders well.

Operations were begun on October 19, 1951, with a small rotary workover rig. On November 6, while cleaning the old hole at 2,950 ft., the well blew out making an unestimated amount of gas. Although the well blew wild through the annulus between the 9⅝-in. surface casing and the drill pipe (which was dropped in the hole), it luckily did not catch fire. After 4 days, with the help of a special crew, the operators successfully installed a master gate on the surface casing and directed the gas flow through a flareline to a burning pit.

Union Producing Co. assumed operation of the well after purchasing a partial interest in the well and lease block from Northeast Mississippi Oil Co.

A large rotary rig was immediately moved on the well and, 40 days after it blew in wild, Union was successful in partially killing the well with heavy mud so that it could safely be shut-in. It was then necessary to clean out the 2,950 ft. of drill pipe which had been dropped in the hole. After 54 days of continuous fishing operations, 24 days of which were spent washing and cutting through pressure-control equipment, all but approximately 260 ft. of the drill pipe was recovered.

Fishing operations were completed with the top of the remaining drill pipe at 5,232 ft. Then 5½-in. casing was cemented with 2,270 sacks at 5,186 ft. at a point 70 ft. above the Carter sand (Mississippian-Chester). The well was brought into production February 17, 1952, producing gas from the open hole below 5,186 ft. The open-flow potential of the 1 Sanders was calculated at 35,000 M.c.f. of gas per day.



THIS LOG of Carter Oil Co. 1 Sanders in the Muldon area was made in 1941 prior to the well's abandonment as a dry hole at 6,059 ft. Union Producing Co. tried it again in 1952 and brought in the well as a gas producer from open hole below 5,186 ft. Fig. 3.

Development

Soon after completion of the discovery well, Union Producing Co. began operations on two additional wells (Fig. 2). The 1 Neal (21-15s-6e) was located 2,300 ft. northwest of the 1 Sanders and the 1 Watson (31-15s-7e) located about 4 miles east and slightly south of the 1 Sanders. The latter well, belonging in the wildcat category, is included here for the sake of completeness.

Some factual data concerning these wells are tabulated here:

Well—	Spud	Comp.	Elev.	Total depth	Age of rocks at total depth	Remarks
1 Neal	2-21-52	8-10-52	270 ft. DF	6,553 ft.	Devonian	Abandoned
1 Watson	3-12-52	8-26-52	276 ft. DF	6,732 ft.	Devonian	Abandoned

In both wells, nearly all the Paleozoic section was almost solidly diamond cored. Coring began at 2,801 ft. in the 1 Neal and at 1,866 ft. in the 1 Watson. A vast amount of geologic information was afforded by these cores. The brevity of this paper permits only general statements regarding the lithology, paleontology, etc., of them. This information is found under a separate heading.

Low structural position and poor reservoir conditions in the Chester were the main factors accounting for these two dry holes. Numerous tests in each well failed to reveal the presence of oil or gas in any commercial quantity.

Drilling and completion . . . All wells have been drilled with rotary rigs and from 75 to 90 days have been required to complete and test a producing well. Approximately 1,200 ft. of 9⅝-in. or 10¾-in. surface casing is set to a depth below the Tuscaloosa-Pottsville contact. Completions have been made both open-hole and through perforations. In each case where a well has been completed through perforations, the sand has been hydraulically fractured by the sand-oil method. Tests indicate this treatment has successfully increased the open-flow potential by a substantial amount. However, the long-range value of this treatment is not known because all wells have been shut-in and have not been connected to a gas transmission line (March 1, 1954).

All wells have been located on 320-acre drilling units and have been completed in the Sanders sand zone of the Chester gas pool (see Fig. 3). At this writing, it appears that the productive limits of the Chester gas pool at Muldon have been fairly well defined.

Geology

Stratigraphy . . . The stratigraphy of Muldon field is presented in graphic form in Fig. 3. A comparatively thin (about 1,100 ft.) veneer of Upper Cretaceous (Selma, Eutaw and Tuscaloosa) clastics overlies the Pottsville formation (Pennsylvanian). This shallow sequence is characterized by thick, fine-to-coarse-grained sands which, in gen-

eral, are excellent sources of potable water. The Tuscaloosa formation contains an abundance of varicolored chert and quartz gravel. Upper Cretaceous sediments dip west at the rate of about 30 ft. per mile.

All the Pennsylvanian rocks at Muldon are included in the Pottsville formation. These beds underlie the Upper Cretaceous sediments with angular discordance, and the Pottsville dips regionally south at a rate exceeding 250 ft. per mile.

It is quite possible that certain beds of Parkwood age[3] have been included by the author in the Pottsville formation. This formation is about 3,800 ft. thick and is composed of an alternating sequence of fine-grained sands and dark-gray carbonaceous shales which often contain thin irregular interbeds of gray micaceous sand.

Within this sand-shale sequence are a few zones, usually not over 50 ft. thick, composed of very coarse-grained conglomeratic sand containing an abundance of quartz pebbles varying in size up to that of a large pea. Minor amounts of low-grade coal and fist-size siderite cobbles occur irregularly. Several horizons are fossiliferous, with crinoids and brachiopods being the most abundant types.

The unconformity, if present, separating the Pottsville formation from the underlying Chester series, is not evidenced by any of the usual geologic criteria. Its position at Muldon is largely determined by regional sample and electric-log correlations.

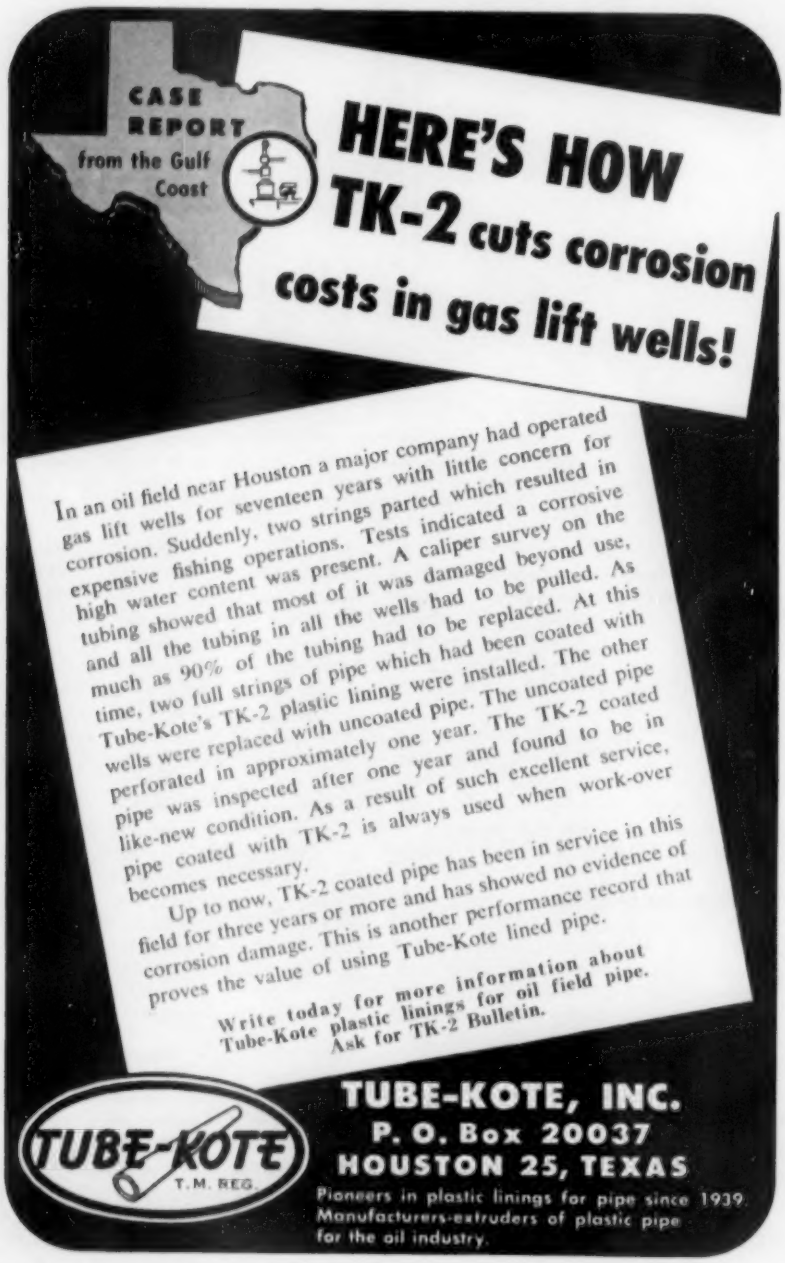
The Chester series is about 1,400 ft. thick; and, in brief, is composed of gray carbonaceous shale and fine-grained, siliceous, well-packed, poorly sorted sands. In the upper half of the Chester are numerous beds—up to 20 ft. in thickness, of black, brown, and tan fossiliferous limestone—which in many places are oolitic. The Millerella limestone, usually composed of three limestone beds, is an excellent marker at Muldon. Green waxy shale and mottled red, purple, lavender, green, and gray shale is present in varying amounts in the upper half of the Chester. Regional problems associated with the Chester rocks have been discussed in some detail by Everett.[4]

Only 40 ft. of Iowan[5] (Kinderhook, Osage and Meremac) rocks are present at Muldon. For the most part, the Iowa is composed of white, tan, black, red, and mottled black, pink, green, and white, coarsely crystalline, crinoidal limestone with very minor quantities of gray chert. The base of the Iowa has tentatively been chosen at the base of the St. Joe limestone, which at Muldon is characteristically a bright-red crinoidal limestone about 12 ft. thick. Other than the St. Joe limestone, rocks of the Iowa series at Muldon have not yet been given formational names.

There is good paleontologic evidence[6] that the few feet of dark shale present immediately below the Iowan is the same age as the Chattanooga shale (late Devonian) of Central Tennessee. This is the westernmost known occurrence of rocks of this age in the Black Warrior basin.

A maximum of 400 ft. of Devonian rocks below the Chattanooga shale have been penetrated in the Muldon area. This section is composed mainly of interbedded gray and brown crystalline limestone and white to blue-gray chert. In general, the percentage of chert increases downward until the bottom 150 ft. of section penetrated is essentially solid chert. Both the limestone and chert are fossiliferous, and provisional identification[7] of the fauna reveals that these rocks are no younger than Onondaga (Middle Devonian) in age.

Structure . . . The productive portion of the Muldon field structure is anticlinal and is bounded on the north and southwest by normal faults which dip north and southwest respectively. Displacement on these faults is several hundred feet, and their dip averages from 65° to 70°. Within the field, the Chester beds dip south at the rate


CASE REPORT
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In an oil field near Houston a major company had operated gas lift wells for seventeen years with little concern for corrosion. Suddenly, two strings parted which resulted in expensive fishing operations. Tests indicated a corrosive high water content was present. A caliper survey on the tubing showed that most of it was damaged beyond use, and all the tubing in all the wells had to be pulled. As much as 90% of the tubing had to be replaced. At this time, two full strings of pipe which had been coated with Tube-Kote's TK-2 plastic lining were installed. The other wells were replaced with uncoated pipe. The uncoated pipe perforated in approximately one year. The TK-2 coated pipe was inspected after one year and found to be in like-new condition. As a result of such excellent service, pipe coated with TK-2 is always used when work-over becomes necessary.
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of 125 ft. per mile. Production is limited on the south and southeast by a gas-water contact in the vicinity of —5,275 ft.

The Upper Cretaceous beds do not reflect the Muldon structure.

Reservoir Data

The Sanders zone is the principal sand in the Chester gas pool. Wherever this sand has been encountered above the gas-water contact, it has been found productive. It is approximately 100 ft. thick and the top 20 or 30 ft. are nonpermeable and shaly in several wells. The overlying Carter zone varies from about 70 to 100 ft. in thickness and as a general rule is extremely tight. It is doubtful if this sand contains a very large proportion of the producible gas in the Chester gas pool.

The gas in Chester reservoir is sweet and is composed of about 85 per cent methane. The remaining 15 per cent consists of ethane plus. Only traces of carbon dioxide and nitrogen are present. The condensate appears to vary somewhat from well to well but an analysis of the condensate from the 1 Sanders well shows this liquid is 64.4° A.P.I. gravity, sweet and water-clear. Preliminary tests indicate a gas-condensate ratio of approximately 80,000 to 1. Bottom-hole pressures are considered normal for the reservoir depth.

Numerous shows of oil have been observed in cores and cuttings from every well in the Pottsville sands. Extensive testing efforts have not revealed the existence of any producible oil, and at this writing it is not known if improved drilling and testing methods might establish Pottsville oil production at Muldon.

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4. Rizer Everett, Certain Stratigraphic Problems in the Warrior Basin, Gulf Coast Assoc. of Geol. Societies, Transactions, Vol. 3, 1953, pp. 31-43.

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6. Louis C. Conant, personal communication (identification by W. H. Hass).

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Acknowledgments

The writer gratefully acknowledges the help and criticisms of Frederic F. Mellen and George W. Field, and the work of Howard Mashaw and Brian Pearson who drafted the illustrations.

EXPLORATION HIGHLIGHTS

MID-CONTINENT

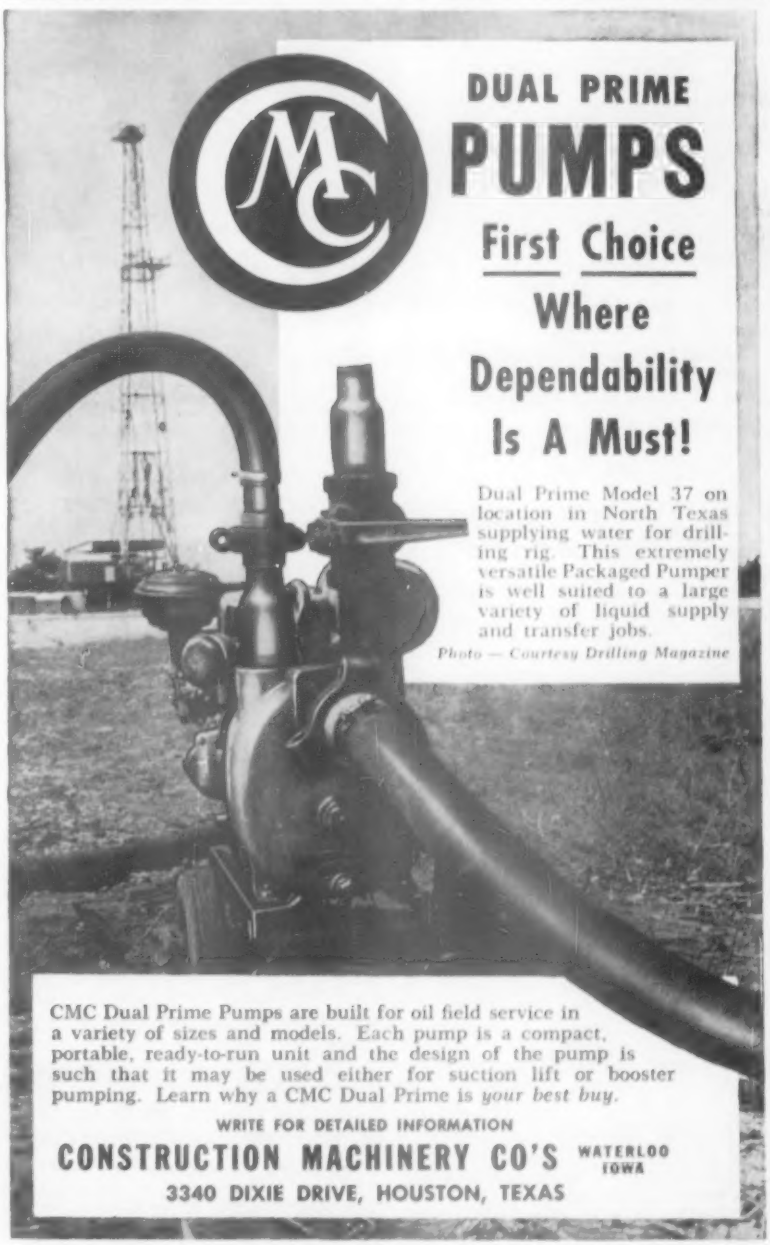
NORTH TEXAS

Cambrian Project is Bend Discovery

Texas-Pacific's 1 Winter, in 178-D-H&TC, has been completed as a good Pennsylvanian Bend discovery, with a daily flowing potential of 233.8 bbl. of 38° oil through 20/64-in. choke. Pay was perforated at 6,261-71 ft. Tubing pressure was 50 psi. and gas-oil ratio was 297:1.

This well was carried to the Cambrian sand, topped at 6,688 ft., minus 4,869 ft. Ellenburger top was 6,501 ft., and minus 4,682 ft. The latter formation developed oil and gas shows on drill-stem tests. Nearest Cambrian production is about 25 miles south in the Whiteflat area of northeastern Fisher County.

J. J. Lynn 1 Ella Pumphrey, also a Bend discovery, 1 mile north of Old Glory townsite, has been completed for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Texas-Pacific Coal & Oil Co. 1 Winter, 12 miles northwest of Aspermont, completed as a 233-bbl. discovery.

a 24-hour potential of 196 bbl. through 20/64-in. choke. Pay was perforated at 6,005-15 ft. Location is approximately 1 mile east of similar production in Pumphrey field.

Grayson County . . . The new projects in the Sherman area have been scheduled for drilling to 11,000 ft.

Langford Drilling Co. has filed application to drill 1 Lone Star 1/5 mile north of Sherman townsite, in J. B. McAnair Survey, A-763.

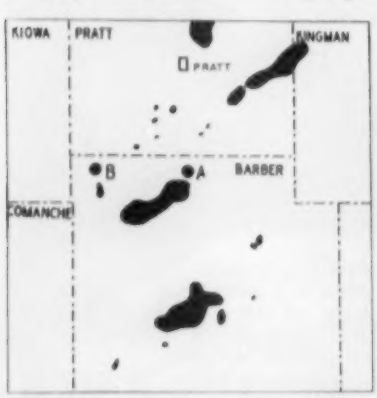
Kennard Cook, Dallas, has staked location for 1 G. V. Adamson 1 mile north of Sherman in the same survey and abstract.

KANSAS

Barber County Has New Gas Discovery Indicated

A new gas discovery for Barber County in southern Kansas is indicated at Brooks Hall and Benson-Montin 1 Grigsby, SE SW SW 15-30s-13w.

Four drill-stem tests in the Simpson sand and one in the Arbuckle gave flows up to 10,000 M.c.f. of gas per day with a trace of oil reported. Top of the Simpson sand was 4,550 ft. and the Arbuckle lime 4,630 ft.

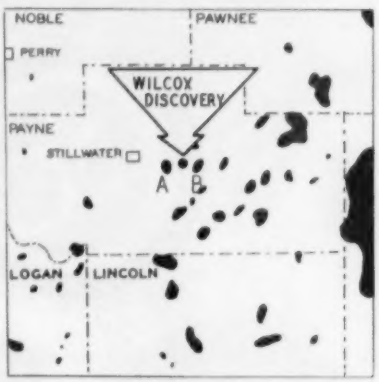


Barber County has a promising new discovery at A on map. Good Simpson sand gas shows were reported with a show of oil in the Arbuckle. At B on map Viola wildcat prospect awaited testing.

More Barber news . . . GMR Oil Co., Lion Oil Co., and H. D. Carter 1 Moffett, NE NE SE 9-30s-15w, another Barber County prospect, had 824 M.c.f. of gas in 15 minutes and recovery of 100 ft. of oil and gas-cut mud and 210 ft. of heavy oil and gas-cut mud on drill-stem test of the Viola lime at 4,585-4,610 ft.

OKLAHOMA

First Wilcox Oil Pool Opened in Payne County



A new first Wilcox sand reservoir has been established southeast of Stillwater.

Royal Oil & Gas Co. 1 Brattain, SW SE NE 26-19n-3e, has established first Wilcox sand production southeast of Stillwater.

Perforations at 4,337-43 ft. got a natural flow of 49 bbl. of oil in 2½ hours through ½-in. choke. The discovery is located between Southeast Stillwater pool at A on map and Northwest Mount Hope field at B on map.

HUGOTON EMBAYMENT

OKLAHOMA PANHANDLE

Another New Pay is Indicated For Camrick Field Region

The third new pay in as many weeks was reported in southeastern Texas County's fast-growing Camrick field area. This brings to the area a total of four indicated and one producing pay zones.

The newest in new pay discoveries is the Toronto-Pennsylvanian. Cities Service Oil Co. 1-B Mathewson, NW SE 19-1n-19eCM, recovered 930 ft. of free gas and 143 ft. of oil and gas-cut mud on drill-stem test at 4,523-32 ft. This well also had Lansing-Kansas City prospects as well as indicated Topeka pay prospects, all in the Pennsylvanian. The lower Morrow is the gas producer in the big field.

Beaver County Reports Big Gas-Condensate Strike

O. H. Parker is testing at an imported wildcat discovery for Beaver County. It is the 1 Hennigh, NW NW 28-6n-28eCM, 4 miles southwest of Southeast Greenwood gas field. The discovery tested 10,000 M.c.f. of gas per day plus 10-20 bbl. of distillate per million cu. ft.

The well is now cleaning up after fracturing. Production is from the Morrow sand through perforations at 6,087 97 ft.

WESTERN KANSAS

Second Oil Well for Haskell County Assured

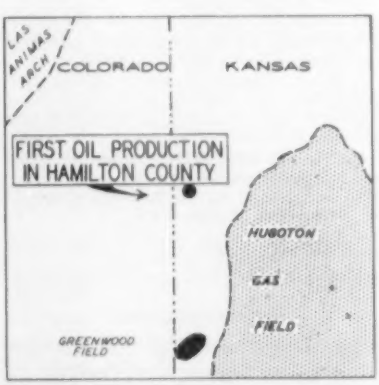
Haskell County has its second oil well assured at Helmerich & Payne, Inc. 17 Jones, NE NE SW 9-27s-34w.

The well had a maximum pump capacity of 190 bbl. of oil daily from perforations in the Mississippian at 5,096-5,122 ft. after fracturing. Testing continues. The well is a ½-mile southwest outpost to the Pleasant Valley field discovery. Both wells are inside Permian Hugoton field production.

Hamilton County Gets Its First Oil Production

United Producing Co., Inc. is installing pump at Hamilton County's first oil producer, the 1 Helfrich, SE SE 6-25s-42w, 12 miles southwest of the town of Syracuse.

The operator swabbed 2¼ bbl. of 39°-gravity oil per hour after acidization from perforations at 5,040-50 ft. in the Cherokee-Penn sand. Previously the discovery was swabbed for 30 bbl. per day, natural. This discovery, which



Hamilton County has its first oil production at United Producing Co., Inc. 1 Helfrich. This gives Kansas 73 oil-producing counties.

gives Kansas its 73rd-producing county, is located 4½ miles east of the Colorado state line. Nearest oil production is in Morton County's Interstate field, 56 miles south. Nearest gas production is in Hugoton field, 20 miles southeast.

TEXAS PANHANDLE

Douglas Sand Extension Seen for Hansford County

Douglas sand production appears to have been extended 2 miles west in the Hitchland field area, north-central Hansford County.

Skelly Oil Co. 2 Jackson, old well worked over, 5 miles south of Hitchland in Section 51, Block 1, WCRR Survey, got gas at the rate of 2,800 M.c.f. per day on test of the Douglas. The well is 2 miles west of the discovery well of the field. It is about 3 miles southwest of the only Douglas sand producer at Hitchland.

First Oil Production for North Hutchinson Indicated

The three-pay North Hutchinson Pennsylvanian field in Hutchinson County has its first oil production indicated at The Texas Co. 1 Harbour, Section 53, Block 5-T, T&NO Survey, 11 miles south of Hansford.

The field has 5 gas wells with production from the Douglas, Cherokee, and Marmaton pays. The oil is indicated in the Marmaton lime. There has been Permian gas indicated in the field, but no production tests have been run.

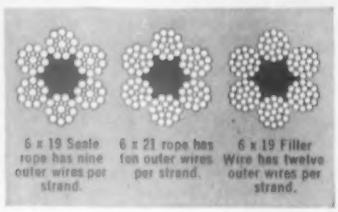
WEST TEXAS-NEW MEXICO

WEST TEXAS

Winkler County Offset Reports Gas on DST

Stanolind Oil & Gas Co. 7-R Coden "A," northwest offset and confirmation attempt to the prolific Ellenburger gas and distillate production opened in Emperor field, Winkler, tested gas in an unidentified formation. The pool opener, Barnes & Lyman 1 Kerr, was completed at 11,480-11,525 ft.

Stanolind's test was run from 8,905-36 ft. Gas surfaced in 15 minutes and was flowed for 15 minutes through ½-in. choke. Daily rate of flow was 2,960 M.c.f., at pressures around 2,700 psi. Recovery in the pipe was 150 ft. of distillate-cut water, not identified as to formation water or the water blanket used on the test. Operators continued drilling, on a 12,000-ft. contract. Location is in 37-B-PSL Survey, 5 miles south of Kermit.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Devonian oil in Headlee field . . . First Devonian production for the Headlee area in Midland County was reported by U. S. Smelting, Refining & Mining Co. 1 Roy Parks, in 28-41-T2S-T&P, southeast of Odessa and ½ mile south of Ellenburger production. Nearest Devonian production is 2 miles to the northwest, in Ector County.

The oil flow came on a test from 9,900-10,010 ft., surfacing in 42 minutes and flowing at the rate of 47 bbl. an hour. Gravity was 50° and gas-oil ratio was 1,500:1.

Dora Roberts second test . . . Forest and Cities Service 2 Dora Roberts B-1, southwest offset to the field Ellenburger discovery, flowed 170 bbl. of oil in 2 hours on a test in the top of the Ellenburger, from 12,840-12,947 ft. On the second test the oil flow increased. At 12,945-13,035 ft. the gage was 157 bbl. the first hour and 205 bbl. the second hour. The flow was through ⅝ and 1-in. bottom and top chokes. Surface flowing pressure was 1,225 psi.

SOUTHEAST NEW MEXICO

Devonian Extension Flows

Jake L. Hamon and Warren Petroleum Corp. 2 Federal-Davis, SE SE 13-17s-38e, on the south side of South Knowles field, reported a heavy flow of oil while drill-stem testing the Devonian at 12,189-12,216 ft.

Using 2,000 ft. of water blanket and ⅝-in. bottom choke, gas surfaced in 1 hour and 8 minutes, oil and water blanket in 2 hours and 24 minutes. It was cleaned into pits for 30 minutes, then flowed at the rate of 43.29 bbl. an hour. Flowing pressure ranged from 1,100-3,575 psi., increasing to 5,000 psi. when shut in.

On test from 12,216-53 ft., oil flowed in 1 hour and 40 minutes, tanking 59 bbl. the first hour and 47 bbl. the second hour. Top of the Devonian at 12,187 ft., minus 8,489 ft., was reported 108 ft. low to the discovery well of the field, approximately 2 miles to the north.

ARK-LA-TEX

EAST TEXAS

Production Renewed at Rowe & Baker Field

Woodbine oil production has been established in the area of the Rowe & Baker field, now depleted, in northwestern Henderson County.

The new well is Hays, Talbert & Walker 1 Mrs. F. E. Cooley. Initial potential through 14/64-in. choke was 148.25 bbl. of 32° oil a day, from the Woodbine at 3,188-93 ft. Tubing pressure was 160 psi. and gas-oil ratio was 223:1.

Arrow points to new Woodbine production in depleted Rowe & Baker field, northeast of Flag Lake field.

Location of 1 Cooley in D. Muckleroy Survey, A-503, is two locations south of a former producer in the field. Four wells in Rowe & Baker field produced 82,400 bbl. of oil up to the end of 1942.

Harrison County . . . Latex Oil & Gas Co. 2 Geisler, J. B. Barton Survey, A-123, has been completed as a new-pay discovery in South Hallsville field. The well made a heavy flow of gas and distillate from the field's regular pay, at 6,490-92 and 6,497-6,504 ft., gaging 70,000 M.c.f. of gas, plus 55 bbl. of distillate per 1,000 M.c.f.

The new and deeper member of the Glen Rose is the Page zone, topped at 6,530 ft. and produced from 6,536-43 ft. Potential was 5,120 M.c.f. plus 13.5 bbl. of distillate per 1,000 M.c.f. Flowing pressures were not reported.

NORTH LOUISIANA

New Geologic Bulletin Published for Webster

A geological report on Webster Parish is the result of the combined work of several Louisiana geologists. It is published by the Department of Conservation of the Louisiana Geological Survey in Baton Rouge. It is Bulletin No. 29.

In the years following 1943, there has been considerable activity in Webster Parish. Several of the old fields have been extended and new oil and gas fields have been discovered. Deep wells in the area have penetrated older formations of Permian and Jurassic age. These developments deemed it advisable to bring up to date the Webster Parish report and publish it as a geological bulletin.

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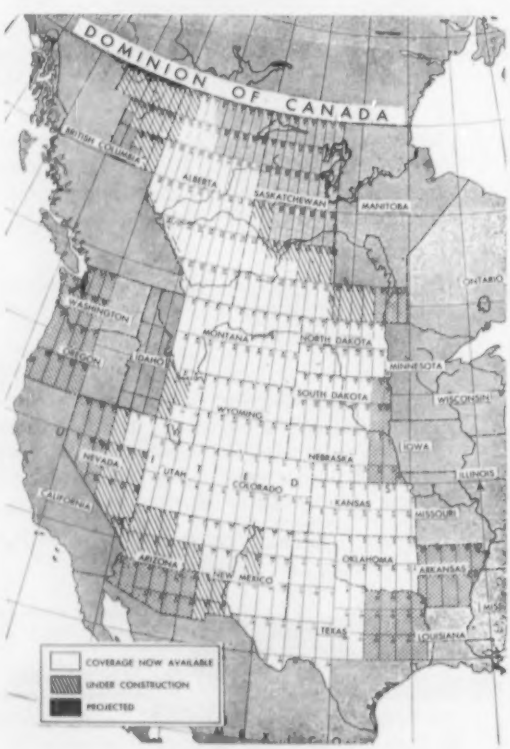


New Buckrange Oil Pool Indicated at Cottage Grove

George Belchic, Jr. 1 E. Johnston, 13-21n-14w, 1¼ miles northeast of Cottage Grove field in northwestern Louisiana, flowed 42 bbl. of 25.2°-gravity oil in 11 hours through ¼-in. choke from Buckrange sand perforations at 1,939-47 ft.

This new oil well is a long extension to production at Cottage Grove field. Its success promises an active development play.

Bossier Parish wildcat northwest of Cottage Grove field reported a flow of oil from the Buckrange sand.

GULF COAST

SOUTH LOUISIANA

Second Well Confirms Beauregard Discovery

Texas Gulf Producing Co.'s discovery last August of gas-condensate production in what now is designated as Hollingsworth field, located a mile northwest of Fulton, in Beauregard Parish, has been confirmed by Byrd Oil Corp. and Temple Hargrove in their 1 Barbe, ½ mile southwest of the discovery well.

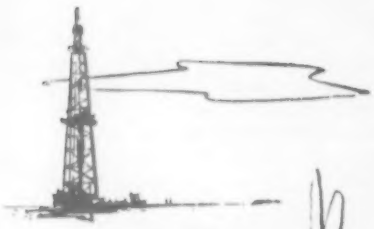
The confirmation well has been completed with a daily flow through 12/64-in. choke of 69 bbl. of 61.6°-gravity condensate with 1,745,000 cu. ft. of gas. Flow was with pressure of 2,526 psi. Pay zone, in lower Frio sand, is perforated at 7,262-85 ft. Interval in the discovery well is 7,275-80 ft.

TEXAS GULF COAST

Deeper Frio Zone Opened In New Bonney Discovery

San Jacinto Petroleum Corp. has opened another pay zone in Bonney field, Brazoria County. Its 2 Corbett, a location west of the operator's initial

in the Field



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well in the area, flowed 165 bbl. of 39°-gravity oil per day through ⅛-in. choke at completion in the pay, perforated at 7,852-58 ft.

The new pay is the deepest so far in the field, opened a year ago by J. S. Michael, with production from a 7,300-ft. upper Frio sand. San Jacinto's initial well, 1 Corbett, completed last September, opened another new Frio pay, with perforations at 7,607-09 ft.

Third Well Completed In West Tomball Field

The new West Tomball field, 4 miles southwest of Tomball, and a mile southwest of Tomball field, in northern Harris County, received additional confirmation with completion the past week of its third well.

The new well is The Texas Co. 1 Coleman O/A, north offset to the discovery well, completed by H. E. Williams last July. It flowed at the rate of 132.62 bbl. of 40°-gravity oil per day through 9/64-in. choke on potential gage. Flow was with pressure of 600 psi. and gas-oil ratio of 393 cu. ft. per barrel. Producing interval in the area's Yegua pay is 5,593-96 ft. Discovery well is perforated at 5,573-74 ft.

The area's other well is a southwest offset to the discovery well. It was completed last December by Williams and Texas Pacific Coal & Oil Co. at 1 Treseler with production not only from the discovery well's pay but also from a slightly higher interval at 5,533-35 ft.

18,000-Ft. Test Planned In Jackson County Field

Magnolia Petroleum Co. is undertaking what is scheduled to be an 18,000-ft. exploratory test in West Ranch field, southeast of Vanderbilt, in Jackson County, middle Texas coast. Greatest depth so far drilled in this field is 9,587 ft., the test being abandoned in Vicksburg.

West Ranch is one of the Gulf Coast's more prolific fields. It was discovered by Magnolia in August 1938. Production is from 12 separate Frio pay zones, ranging in depth from 4,995 to 6,100 ft. More than 630 wells have been drilled, with more than 585 still on production.

Designation of the new deep test is A-417 West Ranch. Location is in Ramon Musquez Survey.

New Production Indicated In Chicolete Creek Field

Sun Oil Co. has encountered promising gas and condensate showings in its 1 Borchers, southwest offset to Atlantic Refining Co.'s discovery well of Chicolete Creek field, 7 miles southeast of Hope, in Lavaca County.

Showings were in Wilcox sand, in which a 17-minute drill-stem test at 8,716-65 ft. got 20 ft. of clean condensate and 90 ft. of gas-cut mud. The test was through ¼-in. chokes with maximum working pressure of 250 psi. Bottom hole pressure was 3,500 psi., flowing, and 3,875 psi., shut-in.

The discovery well, 1 Newhaus, completed last July, is productive of gas and condensate from a series of perforated intervals in a deeper sand section at 9,136-9,206 ft. So far, this is the only production. Two dry holes have been drilled since completion of the discovery well.

SOUTHWEST TEXAS

McAllen Wildcat Opens New Gas-Producing Area

A new gas-condensate producing area has been opened in southern Hidalgo County. Discovery well, 1 Baldwin, drilled by Bettis, Sheppard & Shriver, is rated good for 39,000,000 cu. ft. of gas daily, open flow. Producing zone is in the Frio-Vicksburg section with casing perforations at 6,324-30 ft.

Location is 4 miles south of McAllen, near the Mexican border (Rio Grande

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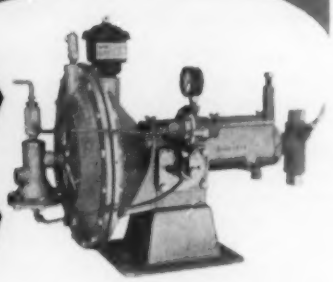

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River). Nearest production is at McAllen. "South McAllen" is the suggested name for the new field.

Duval Wildcat on Pump

Pumping production has been established in a new discovery-well completed by John F. Sullivan at his 1 Murphy, 6 miles east of Freer, in Duval County. Production is from a shallow sand, perforated at 1,849½-57½ ft. Potential gage was 57.8 bbl. of 23°-gravity oil per day. No water was evident. Location is in L. Gunter Survey 66.

EASTERN INTERIOR

ILLINOIS

Illinois Oil Production Up 7 Million Barrels in 1954

Illinois produced an estimated 66,341,000 bbl. of oil in 1954, an increase of about 7,300,000 bbl., or 12 per cent, over 1953 production, according to the State Geological Survey. Daily average production, which was 171,000 bbl. in December 1953, had increased to 195,000 in December 1954. Oil produced during 1954 had a value of about $195,000,000.

A total of 3,254 wells were drilled for oil and gas during 1954, an increase of more than 50 per cent over 1953. Although Illinois ranked only eighth in the United States in production for the year, it had the fifth largest number of wells drilled, being exceeded only by Texas, Oklahoma, Kansas, and Louisiana.

According to the December Drilling Report of the State Geological Survey, the new pools were discovered in December, Harco in Saline County and New City in Sangamon County, bringing the total of new pools discovered during 1954 to 26. Eight extensions to pools were discovered in December: Mt. Auburn Consolidated and Edinburg West in Christian County; Junction North, Herald Consolidated, and Ab Lake West in Gallatin County; Iuka in Marion County; Eldorado North in Saline County; and in Clark County the abandoned Oak Point pool was revived and extended.

The Cypress sandstone was a new pay in the extensions to Ab Lake West and Junction North. Other new pays were the Rosiclare sandstone in the St. James pool in Fayette County and the Palestine sandstone in the Ab Lake pool in Gallatin County.

Between December 1 and January 4 there were 338 wells completed in Illinois, including 201 oil wells and 1 gas well.

In Edwards County, 2 miles southwest of West Salem, Skiles Oil Co. 1 Bunting "A," SW SW SE 24-1n-10e, pumped 170 bbl. of oil on a 20-hour production test in the O'Hara lime at 3,190-94 ft. The operator used 3,000 gal. of acid for treatment.

● In Wayne County, 4 miles northeast of Fairfield, T. G. Jenkins 1 Wheat, NE NE SE 21-1s-8e, flowed 40 bbl. of oil per hour from 3,124-40 ft. in the Aux Vases. This is a ½-mile west step-out from Clay City Consolidated oil field.

● After fracturing in the Waltersburg sand at 2,116-50 ft., R. W. Portis 1 Lassater, SW SW NE 15-8s-7e, flowed at the rate of 720 bbl. of oil per day. This well is ¾ mile northeast of Eldorado, Illinois.

APPALACHIAN

WEST VIRGINIA

In Dry Fork district, Randolph County, West Virginia, Columbian Carbon Co. is moving in at 1208 D. Hill Arnold, rank wildcat, elevation 3,155 ft. It is on the Horton Quadrangle 5.46 miles south of latitude 38 degrees 50 minutes and 2.54 miles west of longitude 79 degrees 30 minutes.

● Allen district, Morgan County, John Fox 1-K-1 Amasa Nestor, drill-

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ing at 1,800 ft., encountered water at 1,050 ft.

● Parker Township, Butler County, Walker et al in 1 John Walker, are drilling out the cable in their fishing job. The depth of the hole is 7,280 ft. Gaskill Township, Jefferson County, Fairman Drilling Co., is still underreaming in 1 Clair Reed, 7,120 ft., depth.

OHIO

A wildcat, 2 miles southwest of the village of Danville, came in with a gas showing in the upper Clinton at 2,878-2,902 ft. and gaged 1,300,000 cu. ft. in 24 hours after treatment. The test was on Wilford Colopy, Section 15, Union Township, Knox County.

● Preston Oil 3 Wyskiver, Section 34, Starr Township, Hocking County, gaged 500,000 cu. ft. and 2 bbl. natural, and made 170 bbl. in a 24-hour test 24 hours after treatment. Gas gaged 300,000 cu. ft.

● A south extension of 800 ft. to the new Glenford pool was reported by Clyde Foraker, Jr. The well on 2 Torbet, Section 9, Hopewell Township, Perry County, made an estimated 20 bbl. natural and 210 bbl. in 24 hours after fracturing. Sand was logged at 2,796-2,818 ft.

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EASTERN KENTUCKY

South of production in Isonville pool of eastern Elliott County, Smith Bradley have a dry hole at 1 J. M. Eldridge. Mississipipan Weir sandstone, the normal producing horizon for the area, was topped at 890 ft. and continued to 1,032 ft. with considerable interbedded shale. No commercial shows were encountered and test has been abandoned at a total depth of 1,042 ft.

On Brushy Fork of Beefhide Creek in the Pike County sector of Big Sandy gas field, Kentucky West Virginia Gas Co. has completed 6,234 M. D. L. Greer as a Mississippian Big lime gas producer. Lime, topped at 2,597 ft. and penetrated to 2,854 ft. total depth made a natural open flow potential of 793,000 cu. ft. of gas daily.

WESTERN CANADA

Sunburst Sand Discovery Reported at East Manyberries

A wildcat in the East Manyberries district, drilled by Canadian Export Gas, Ltd., of Calgary, struck some crude oil in the Sunburst sand, it was reported unofficially but reliably.

Only a few feet of the sand section has been tested, and until further coring and testing operations have been carried out, the well's commercial worth will not be known. The well is the 5-32 East Manyberries, LSD 5, 32-5-4w4, 40 miles south of Medicine Hat.

MANITOBA

Mississippian Oil Strike Indicated at South Regent

The California Standard Oil Co. has indicated oil discovery in the Mississippian at a wildcat in the South Regent

Light gravity oil has been discovered in the granite wash at a wildcat in the Clear Hills area of northwestern Alberta. The discovery, Canadian Gulf Oil Co. 4-15 Clear Hills, is 45 miles northwest of Peace River town and 67 miles east of the British Columbia border.

area, and has set string of production casing to evaluate the find.

The well is the 6-7 South Regent, LSD 6, 7-4-21w1, 4¾ miles northwest of Whitewater Lake oil pool. It is 3½ miles south of Regent town.

PACIFIC COAST

CALIFORNIA

New Oil Discovery In Montalvo Area

A joint wildcat of Sunray Oil Corp. and Ohio Oil Co. has discovered a new deep oil pool about ¾ mile southeast of West Montalvo field in Ventura County. It was completed flowing 74 bbl. of 20°-gravity crude in Sespe sands at 11,748-92 ft.

Located in NE NW 31-2n-22w, 1 Bailard-McGrath had been drilled to a total depth of 13,462 ft. and then plugged back to 12,110 ft. Along the beach to the southwest Standard Oil Co. of California is developing the 11,000-12,000 ft. Colonia pool. Of the six producers completed some have reached drilled depths of almost 15,000 ft. in being bottomed beneath the Pacific Ocean on a state-granted offshore lease.

Vedder Test Watched At Tejon-Grapevine

After finding the Jewett sand at 6,700 ft., Reserve Oil & Gas Co. 12-35 Reserve-Pauley was drilling toward a scheduled depth of 9,000 ft. in search of Vedder (lower Miocene) production. The test, in NW NW 34-11n-19z, was drilling below 7,700 ft. at last reports.

Located almost 1 mile east of the Jewett discovery well, Drilling & Production Co. 33-33 J.V., the Reserve test found the Jewett about 300 ft. higher. Likewise, whereas 33-33 J.V. produced 38°-gravity crude at a 500-bbl. rate, 12-34 Reserve-Pauley yielded gas and an accumulation of condensate on a formation test at 6,685-6,728 ft. About ¾ mile northeast, Reserve 66-27 Reserve was testing at 6,735 ft. after drilling to 7,017 ft.

Santa Clara Deep Tests

Three deep tests were preparing to start in the Piru-Santa Paula area of Santa Clara Valley, Ventura County. About 1 mile northeast of its 14,000-ft. Fillmore discovery and ½ mile northwest of 1 Hardison Ranch, recently suspended at 15,630 ft., Standard Oil Co. of California was preparing to start 2 Hardison Ranch-2 in 27-4n-20w. Near the northeast city limit of Santa Paula, in 2-3n-21w, Standard also was erecting derrick for 1 Vanderkarr. The third test, which will probably drill to about 14,000 ft., will be General Petroleum Corp. 1 Edwards near Piru.

Huntington Beach Growing

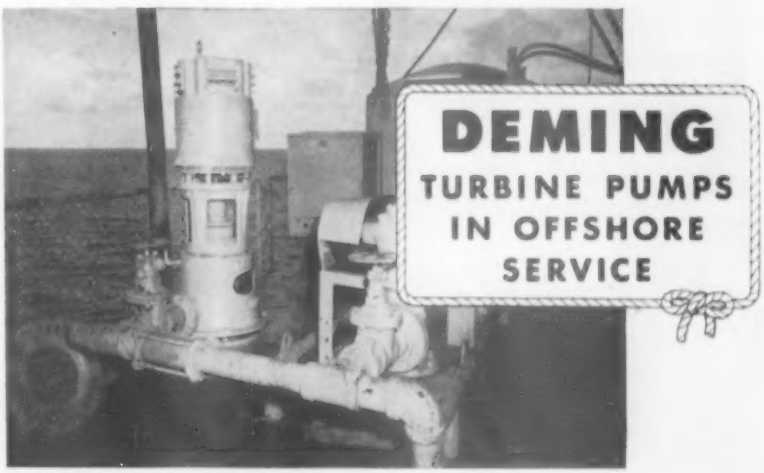
New discoveries on the southeast edge of Huntington Beach have touched off a townlot drilling splurge. Six producers had been completed in the new 3,800 ft. Jones pool. Some 18 rigs were drilling either for this pay or a new 5,500-ft. pool. While not expected to exceed 50 acres in size, development of the shallow pay is highly competitive. State well-spacing laws do not apply as the pool is an extension of older portions of the field.

WASHINGTON

New Washington Wildcat

Continental Oil Co. was preparing to drill 1 Griffin & Waggoner in Grays Harbor County, Washington. Located in the Still Creek area, 33-19n-7w, it will be the seventh wildcat drilled by the company in Washington during the past year. Early in January, 1 G. Hogan in 22-16n-9w was abandoned at 3,952 ft.

"Down to the Sea in Ships"



Twenty-six miles offshore in the Gulf of Mexico, the Deming Vertical Turbine Pump pictured above is in action. Its job is to circulate water for cooling three 325 hp diesel engines in drilling rig service. The Deming Turbine Pump was selected for its efficient, dependable performance and easy maintenance.

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ARIZONA

Colorado Basin Associates, Inc., 1 Federal was abandoned at 6,012 ft. in Yuma County, Arizona. It was the third test by the group, both previous tests having been unsuccessful. It was located 12 miles southwest of Yuma, in 24-10s-24w.

ROCKY MOUNTAIN

NEBRASKA

Cheyenne County Discovery

Ryan-Davis Oil Co. and Cimarron-Western Drilling Co. swabbed at the rate of 9 bbl. of oil per hour at 1 Graham, SW SW SW 20-16n-51w, Cheyenne County. Test was of perforations 5,217-33 ft. in "J" sand. The operators are installing pump. The discovery is slightly more than 5 miles east of Woten field, and well north of established production in the county.

Kimball County Wildcat Still Testing

Skelly Oil Co. swabbed 67 bbl. of oil and 7 bbl. of water in 5 hours from 1 Phillips, SE SE NW 8-12n-54w, Kimball County. Production is from "J" sand perforations at 6,111-20 ft. The well was Sandfract prior to this test.

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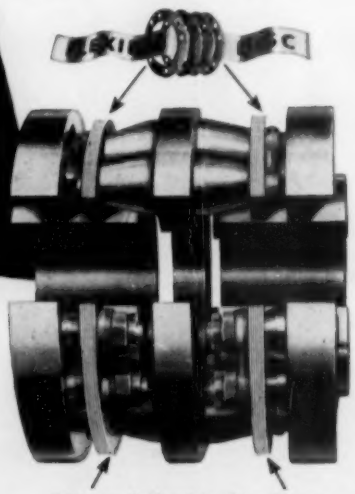

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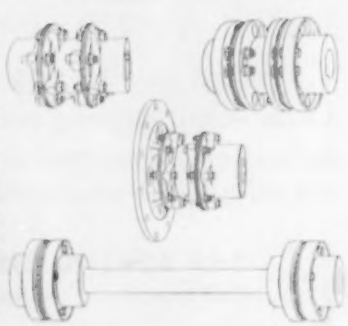

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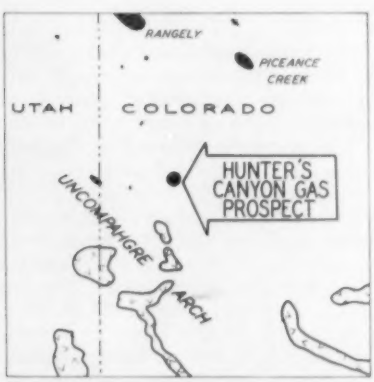
COLORADO

Western Colorado Wildcat Recovers Gas

Great Basins Petroleum Co. has tested an apparent Mesaverde gas discovery north of Grand Junction, in Mesa County. Test of 1 Hunter's Canyon Unit, SE SW SW 29-8s-100w, recovered gas at the rate of 1,750,000 cu. ft. per day on each of two separate tests. The operator estimated a potential of at least 4,000 M.c.f. per day on the basis of tests already run.

Test of the interval 902-57 ft. flowed 1,750,000 cu. ft. per day over a 26 hour, 48 minute period. Flowing pressure was 85-170 psi. A similar rate of flow for 9 hours, 35 minutes was reported on test of the series of perforations 763-98, 811-15, 819-26, 835-39, 844-53, and 859-64 ft. Flowing pressure on this test was 60-150 psi.

Great Basins reported the hole full of high gravity oil during testing. The well was drilled through Mesaverde to total depth of 2,132 ft. No cores were cut or tests taken. Location has been made for a twin well which will test to Dakota and will core and test Mesaverde zones which are productive in the present well. The wildcat is in the Piceance basin, about 5 miles north of production at Asbury Creek, also a gas field.



Great Basins Petroleum Co. reported a flow of gas at a rate estimated at 1,750 M.c.f. per day at the Hunters Canyon Unit wildcat in Mesa County.

New Pay Tested at Little Beaver, East

Continental Oil Co. has recovered oil from "J" sand at 1 Adkins, NE SW SW 26-1s-56w, Washington County. The well, in the Little Beaver, East area is is apparently a new-pay discovery. Previous production is from "D" sand. The 1 Adkins also found production in this formation. The "J" sand test was of the interval 5,150-58 ft. Recovery

PACKAGED COMPRESSOR *SPEEDS* PENETRATION RATES ON TEST WELLS

OIL INDUSTRY TECHNOLOGISTS, investigating methods of reducing present-day drilling costs, recently started a series of tests using aerated mud. Of major importance to this program was the selection of a compressor. The unit had to deliver, automatically, full rated capacity over a wide range of pressures — to operate virtually unattended, leaving the crew free for regular duties. When moving it was essential that only oil field equipment be used and no special foundation required at the drilling site.

A Beaird-Ingersoll-Rand 4-Cycle Packaged Compressor Plant, 220 horsepower 8 JVG, was purchased by Phillips Petroleum Company for this task. Beaird engineers installed automatic controls that permit it to slow down or pick up speed over a range of 50% to 100% according to discharge conditions. A stop valve on the rig floor is all that is required to shut off air instantly for a connection or a trip. Other automatic controls safely handle this sudden change in operation — slowing the engine and unloading the compressor cylinders.

Mounted on its own heavy steel skid base, the compressor is set in a shallow pit near the rig and ballasted with sand or caliche. It moves as a single over-the-road package between drilling sites. On the new location only connections to fuel and mud lines are required to place it into operation.

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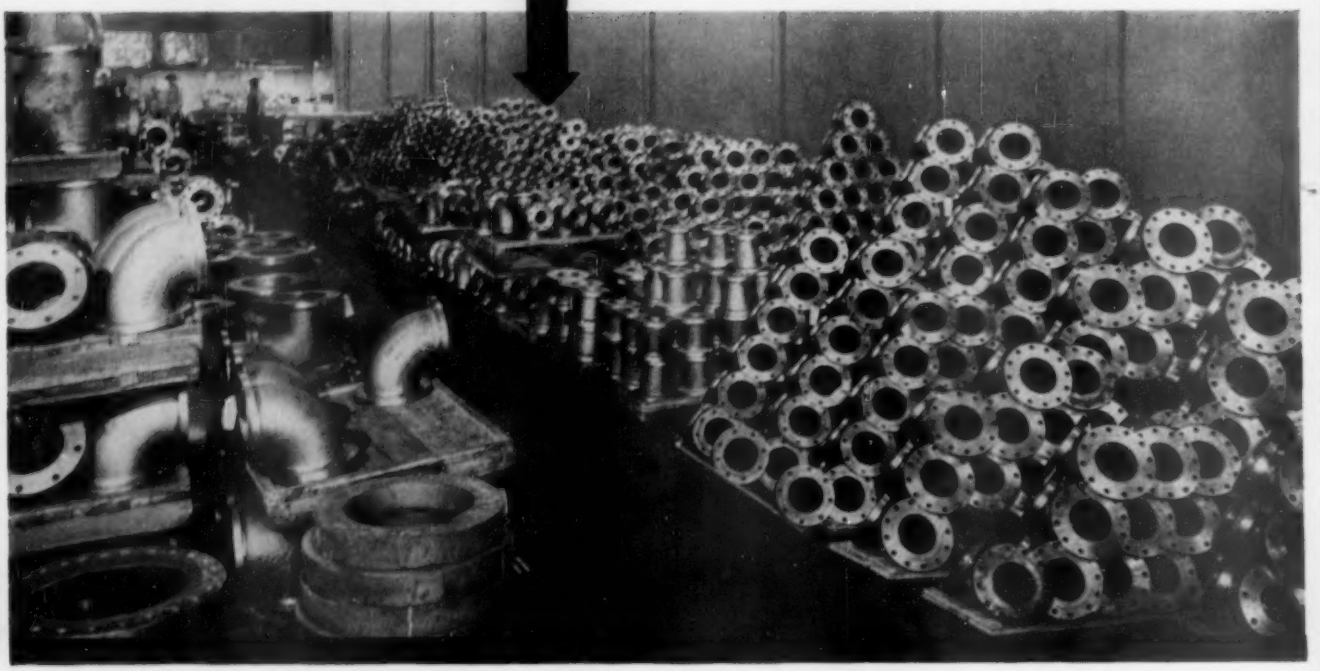

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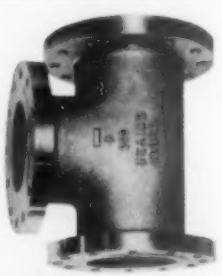

Bolt Hole Circles and Flange Circumferences Concentric with Bore

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PACKAGED COMPRESSOR PLANTS

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PRESSURE BULK STORAGE

ANHYDROUS AMMONIA EQUIPMENT

LP-GAS SYSTEMS

was 810 ft. of oil, 540 ft. of heavily oil-cut mud and 220 ft. of gas-cut water. The operator is running logs.

WYOMING

Gas Recovered at Pinedale Anticline Wildcat

Continental Oil Co., El Paso Natural Gas Co. and Malco Refineries, Inc. recovered gas at the rate of 1,500 M.c.f. per day on test of 1 Unit, C NE SE 9-30n-108w, Sublette County. The zones 9,920-32 and 9,950-82 ft. were tested. Flow was over an 8 hour period. Formation is not positively identified and is possibly Fort Union.

The well is the first test of the unit which contains more than 90,000 acres. Total depth is 10,140 ft. The operators will continue testing. Several other zones are unofficially reported to have had shows.

Gulf Oil Corp.'s Southwest Tablerock Unit wildcat in Sweetwater County reported a flow of gas from the Mesaverde. El Paso Natural Gas Co. et al 1 Unit on the Pinedale Structure in Sublette County is still testing after a reported gas flow.

MONTANA

Fallon County Confirmation Recovers Oil

McAlester Fuel Co. and Goldston Oil Co. recovered 555 ft. of free oil on test of Red River at a confirmation to the recent East Baker Ordovician discovery in Fallon County. The well, 1-A NP, C NW NE 19-7n-61e, was tested at 9,171-95 ft. and tool was open 2 hours and 45 minutes. Flowing pressure was 425-610 psi. The operators are coring below 9,250 ft. and will test Winnipeg before attempting completion. The well is a southeast offset to the discovery, which is tentatively credited with the first production from stratigraphic trap in the deeper portion of the Williston basin.

NORTHERN NEW MEXICO

San Juan Basin Strat Test Series Started

Continental Oil Co. has located for three of a proposed five well stratigraphic test series in northern New Mexico and extreme southern Colorado. In San Juan County locations are made in NW NW NW 17-32n-19w, and NW SE NW 20-32n-19w. A single location has been announced in Montezuma County, Colorado in NE SW SE 24-32n-19w. The entire series in the general Mancos Creek area. No data will be released until the series is complete.

Big Horn Basin Wildcat Testing

Sohio Petroleum Co. swabbed at the rate of 24 bbl. of oil per hour at 1 Water Creek Unit, SE SE SE 36-44n-91w, Washakie County. Recovery was from Phosphoria, and oil is 17° to 18° gravity, and is sweet in contrast to usual Phosphoria crude in the Big Horn basin. Details of perforated intervals and length of swab test have not been reported. The well was drilled to a total depth of 6,418 ft. and casing landed at 6,300 ft. without release of any data.

(Continued on page 186)

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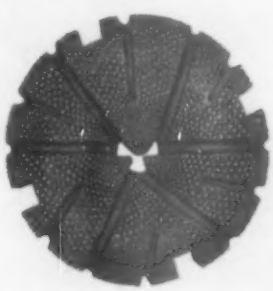

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PERSONALS

Arrow "Boss" on Go

Edmiston takes to fields to keep tab on firm's 24 rigs

CREWS on Arrow Drilling Co. rigs, although scattered all the way from Texas to Alberta, never know when the "Boss" will drop by on an inspection trip.

But the unexpected arrival of David L. Edmiston, president of the company, causes little consternation for he is a soft-spoken individual whose friends would have to think hard to remember when he ever used a harsh word.

"If he gets irritated," explained one employe, "he never shows it."

Edmiston analyzes himself in almost the same way, except in fewer words: "I usually listen instead of talk."

In the field . . . There are two good reasons why Edmiston makes a practice of visiting his rigs occasionally. First, he knows he can't keep in close touch with 24 drilling crews without spending considerable time outside his Tulsa office. Secondly, he'd rather be in the field than in the office, anyway.

Arrow Drilling Co., one of the largest in the country, now has six rigs operating in Canada. Most of its other 18 rigs normally are scattered through Texas, New Mexico, Oklahoma, and Louisiana. The company also operates in Mississippi, Georgia, and Louisiana.

Born at Sherman, Tex., Edmiston grew up on a farm near Perry, Okla. After finishing high school at Perry he went to work as a roustabout in the old Midco field.

He moved from one oil field to another during the 20s, working for Comar Oil Co. for 5 years at Tonkawa and later joining Mead Bros. Drilling Co. at Tulsa. He started with Arrow in 1932 as a production man at Tyler, Tex.

He was sent to Dallas as contact and production man for Arrow in 1934, then to Oklahoma City, and in 1940 he was transferred back to Tulsa. Shortly after moving to the home office, Edmiston was promoted to vice president in charge of production. He moved up to president of the firm last October, succeeding I. H. Patton, Jr., who died several months earlier.

At home . . . Edmiston and his wife, Margaret, have seven children—three boys and four girls—ranging down to 13 years of age.

One of their sons, Bill, lives on the old family farm at Perry, where he raises Hereford cattle. The farm is the Arrow president's favorite retreat. He spends many of his weekends there, except when he fails to make plane connections while on a field trip.

Also vying for his weekend attention are fishing and football. He occasionally casts a line in one of the lakes in northeastern Oklahoma, and although the University of Tulsa football team lost 11 straight last year, Edmiston is in the stands for every home game.

Edmiston's other two sons are in the oil business. Dave operates two portable-steam rigs and an oil treater in Kansas. Eddie, the youngest boy, is following in familiar footprints. He started in the oil fields as a roughneck and recently transferred to a job as contact man for a drilling company. The company happens to be in competition with his dad's.

Earl E. Wall has joined Louisiana Land & Exploration Co. as a petroleum reservoir engineer at New Orleans, La. Wall was a field petroleum engineer with Brown Brothers et al. at Post, Tex., before going with LL&E.

Raymond L. Tollett, chairman of the board and president of Cosden Petroleum Corp., was elected a director of the First National Bank of Fort Worth at a recent meeting of the bank's stockholders.

George M. Jones, Jr., and **Edwin Hill** have been appointed assistant project engineers in the engineering division of the manufacturing department of Sun Oil Co. Jones has been with the company since 1939 when he went to work at the Marcus Hook, Pa., refinery as an electrician. Hill began his Sun career in 1952 as a draftsman.

Sidney D. Farrar, engineer in Lone Star Gas Co.'s production department, has been transferred from Athens, Tex., to Midland.

Addison Young, Phillips Petroleum Co., has been elected president for 1955 of the West Texas Geological Society. Other new officers are: **Tom Koch,** Superior Oil Co., vice president; **Larry S. Melzer,** Statex Petroleum Co., secretary; and **Marshall L. Mason,** treasurer.

Ernest A. Slade has been appointed manager of its pipeline department by Warren Petroleum Corp. Slade had

E. A. SLADE

C. W. MILLER

been serving as superintendent of maintenance and construction for Service Pipe Line Co. before joining Warren. **Charles W. Miller,** former general superintendent of Midland Gasoline Co. at Conroe, Tex., has been named assistant manager of the pipeline department by Warren.

George D. McClelland, formerly with Magnolia Petroleum Co. and Hunt Oil Co., has joined George Armistead & Co., Washington, D. C., as a mechanical engineer. **Frank R. Grant,** formerly with Cooperative Farm Chemicals, Inc., at Lawrence, Kans., has joined the engineering staff of Armistead & Co.

Franklin K. Kennedy, III, has been promoted to plant engineer by Stanolind Oil & Gas Co. at its Salt Creek natural-gasoline plant at Midwest, Wyo. Before his promotion, Kennedy served as petroleum engineer with Stanolind at its Hastings gasoline plant in Alvin, Tex.

James C. Phelps has been promoted to manager of development and technical advisor for Continental Pipe Line Co. with headquarters in Ponca City, Okla. Phelps formerly was superintendent of Pioneer Pipe Line Co., an affiliate of Continental. Phelps succeeds **F. C. Whiteside,** who recently transferred to Calgary to become associated with Hudson's Bay Oil & Gas Co., Ltd., Continental's Canadian affiliate. **L. P. Wadell,** Billings, Mont., has been promoted to superintendent of Continental

PERSONALS

Pipe Line's communications division at Ponca City. He succeeds **Frank E. McFarlin,** who recently was appointed senior office engineer for the pipe line company.

Oscar Larson, former assistant general manager of Tide Water Associated Oil Co.'s Avon refinery at Associated, Calif., has been promoted to general manager of the refinery. Larson succeeds **Thomas O. Edwards,** who was recently named manager of manufacturing for the company's western division.

E. A. Markley, manager of Sunray Oil Corp.'s geological department, will retire February 1. Markley entered the oil business in 1922 when he joined the old Kawfield Oil Co., which operated in Tulsa and Cushing. In 1924, he joined the former Waite Phillips firm which was merged into the former Barnsdall Oil Co. in 1926. He served as chief geologist for Barnsdall from 1932 until 1950 when the company was merged into Sunray Oil Corp.

Gerald F. Bassler has been appointed director of training of Continental Oil Co.'s manufacturing department with headquarters in Houston. Bassler, a former senior training supervisor with Creole Petroleum Corp. in Venezuela, succeeds **M. L. Cobb,** who recently was promoted to superintendent of Conoco's refinery at Ponca City, Okla.

T. P. SIMPSON

Thomas P. Simpson has been elected vice president and director of manufacturing of General Petroleum Corp. Simpson joined General in 1924 as a chemical engineer. In 1935 he was transferred to Socony-Vacuum Oil Co., Inc., of which General is the western affiliate, as chief development engineer of Socony-Vacuum Laboratories. He returned to General in August 1953 as assistant director of manufacturing. Simpson succeeds **Gale L. Adams,** who retired December 31.

Jack R. Bruner, former chemical engineer with George Armistead & Co., Washington, D. C., has joined the refining staff of Hancock Oil Co. Bruner had recently been serving as project manager for Armistead on a construction project the firm was doing at the Hancock refinery.

New York Chapter of Nomads Elects Officers for 1955

The New York Chapter of Nomads recently elected its officers and regents for 1955. Stewart D. Beckley, of Beckley, Haltom & Hickman was named to head the organization during this year. Other officers elected are, seated left to right, Maurice F. Delano, R. S. Stokvis & Sons, Inc., secretary; Herb E. Maland, R. J. Eiche & Associates, Inc., vice president; Beckley; Douglas L. Grill, Link-Belt Co., treasurer; and E. E. Andreason, W-K-M Manufacturing Co., Inc., sergeant-at-arms. Standing left to right are Russ V. McIntire, Baker Oil Tools, Inc., regent; David C. Washburn, Cameron Iron Works, Inc., assistant secretary; Don E. Kircher, Gardner-Denver Co., assistant sergeant-at-arms; William E. Volkman, Cardwell Manufacturing Co., Inc., assistant treasurer; and Norris L. Boulden, Jr., International General Electric Co., Inc., regent.

F. B. BEHRENS

Fred B. Behrens has joined Richfield Oil Corp. as staff assistant to **David E. Day,** vice president and manager of the manufacturing and pipeline department. Behrens, a former vice president of Wilshire Oil Co., Inc., will be in charge of special assignments on supply and distribution of crude oil and refined products.

John R. Kinnie has joined British-American Oil Producing Co. as district engineer in the company's western district at Los Angeles. Prior to joining British-American, Kinnie worked with Arabian American Oil Co. for 7 years and with Socony-Vacuum Oil Co. for 4 years—2 of them spent as area engineer in Venezuela.

Thomas O. Edwards is new manufacturing manager of the western division of Tide Water Associated Oil Co. He was named to the post last week to succeed **W. P. Hugo,** who has retired after 41 years of service with the company. Edwards joined Tide Water in 1921, following his graduation from the University of California. Before his most recent promotion he had successively served as foreman, tract superintendent, process superintendent, assistant general superintendent, general superintendent, and general manager of the company's refinery at Associated, Calif. Edwards lives at Danville, Calif.

Ted Asay, former petroleum engineer with Stanolind Oil & Gas Co. in its division office at Oklahoma City, has been promoted to field engineer with the company at Vivian, La.

Robert S. Agatston has been promoted to assistant to the area geologist at Dallas, Tex., by Atlantic Refining Co. Before his promotion, Agatston had been serving as subdistrict geologist with Atlantic at Albuquerque.

Robert Klabzuba, until a year ago chief geophysicist of Texas Pacific Coal & Oil Co., Fort Worth, has joined W. A. Moncrief, Fort Worth independent, as geologist and exploration manager. Klabzuba resigned from Texas Pacific in January 1954 and during the past year has been operating as a consultant in Fort Worth.

E. A. Markley, manager of Sunray Oil Corp.'s geological department, will retire February 1 after 33 years in the oil industry. In 1924, he was with the old Waite Phillips Oil Co., which merged with Barnsdall Oil Co. in 1932. He became chief geologist for Barnsdall. When Sunray absorbed Barnsdall in 1950, he became manager of the geological department.

PERSONALS

J. M. Land, field foreman with Magnolia Petroleum Co., has been transferred from Kilgore to Winnsboro, Tex.

William H. Conkling has been named chief geologist of Plymouth Oil Co., effective February 1. Conkling, who will be located at Sinton, Tex., site of the company's operating headquarters, succeeds Alvin P. Loskamp, who was killed in a plane crash last November.

W. G. KLASSEN

W. G. "Bill" Klassen has been promoted to drilling superintendent by Thomas P. Pike Drilling Co. Klassen replaces **John Fowler,** who resigned. Klassen began his oil-industry career in 1932 as a rotary helper in Lost Hills field, Calif. He joined Pike Drilling in 1947 from Camay Drilling Co., where he had been serving as drilling superintendent. Before his promotion, Klassen had been serving Pike Drilling as assistant drilling superintendent.

B. D. Leuty has been elected a vice president of Cities Service Pipe Line Co. and named manager of all pipeline facilities of Cities Service Oil Co. (Del.) and subsidiaries, including joint interests in other lines. Leuty joined Cities Service in 1924 as a member of the company's engineer-training program. **Gerald McGrew** has been named manager of the company's crude-oil supply division. **R. V. Sellers** and **George Nolley** have been named assistants to the new manager. McGrew joined Cities Service in 1940 as a valuation engineer.

B. D. LEUTY

G. McGREW

Ivan R. Cunningham has been elected a director and vice president of International Petroleum Co., Ltd., an affiliate of Standard Oil Co. (N.J.). Cunningham started his oil career with Standard Oil Co. of Venezuela in Maracaibo in 1924. He stayed on when the company became Creole Petroleum Corp. and became a director in 1948. In 1953, he joined the staff of the producing coordination department of Jersey Standard.

Quentin Benedict has been named refinery superintendent of its Potwin, Kans., refinery by Vickers Petroleum Co., Inc. Benedict had been serving with Deep Rock Oil Corp. as assistant process superintendent. **T. Ben Arnold,** former refinery superintendent, has been named refinery manager, a newly created post.

M. L. BROWN

Maurice L. Brown has been named president of Century Refining Co., which has recently leased the facilities of the Shallow Water Refining Co.'s refinery at Garden City, Kans. Other officers named are **Harry Litwin,** vice president; **Blaine Sheley,** refinery superintendent; and **C. J. Farley,** sales and transportation manager.

DEATHS

Samuel J. Maddin, Sr., a pioneer in the natural-gas industry in the Owensboro, Ky., area, died January 13, at his home in Owensboro. Maddin was a member of the firm of Shippey, Maddin & Parrish, later known as the Missouri-Kansas Pipe Line Co. The firm then became the Panhandle Eastern Pipe Line Co. and Kentucky Natural Gas Corp. Kentucky Natural and Memphis Natural Gas Co. were later formed into Texas Gas Transmission Corp., which headquarters at Owensboro.

V. E. Ekholm, 53, Abilene, Tex., independent oil operator, died at Abilene recently. Ekholm organized Viking Oil Co., Abilene, and Mantan Chemical Co., Dallas and Panama. He had been associated with the U. S. Geological Survey, Pierce Oil Corp., and Clark & Cowden, in Texas, and with Gulf Oil Co. in South America. He also served from 1942-1946 as technical advisor to the Bolivian Government and as manager of Bolivia's oil-field operations.

Rolla L. Long, manager of the southern region for Hughes Tool Co., died after suffering a heart attack while on a business trip to Lafayette, La., January 13. Long had been a salesman for Hughes since 1924 when he joined the company in the Ark-La-Tex area. He was named manager of the southern region in 1946.

Frank Durrell 65, sales engineer for J. P. Ratigan, Industries for 20 years and active in the oil fields of California for 35 years, died January 14, in Los Angeles.

L. D. Bartell, 52, chief geologist for McAlester Fuel Co., died suddenly at his home in Magnolia, Ark., January 16. Bartell, who had been with McAlester 5 years, was a former employe of Skelly Oil Co. Bartell was credited with the finding and development of several large fields, including the Pinola gas field in Louisiana and Texas.

Edward L. Wagon, 63, assistant vice president of Sinclair Oil Corp., died at his home in New York City January 13. Wagon joined Sinclair in 1916 at Tulsa and after serving there for 4 years was transferred to New York. He held various executive posts with Sinclair during his 38 years of service.

George Benjamin Bancroft, 76, retired vice president and general manager of Gilcrease Oil Co., died January 13, at his home in San Antonio. Bancroft resided in Tulsa from 1916 to 1937.

Joseph Glass, 60, president and director of Middle States Petroleum Corp., parent company of Midstates Oil Corp., died January 18, in a New York hospital.

Ward S. Prescott, 61, president of Equitable Gas Co. of Pittsburgh and West Virginia from 1940 to 1950, died in Washington, D. C., January 13.

J. E. Bumpus, 79, retired superintendent of the D. W. Franchot Co., died at his home in Tulsa recently.

James E. Purdy, 60, vice president and controller of Lummus Co., of New York, died at his home in New York recently after a long illness.

James H. Coker, independent oil operator in Texas and the Mid-Continent oil fields, died recently at his home in Amarillo, Tex.

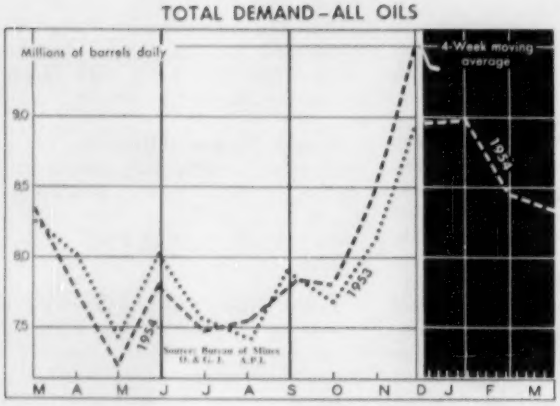
George C. Williams, 59, petroleum geologist of Los Angeles, died recently at his home there.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,651,125	UP	94,350	UP	368,035
Crude stocks	259,460,000	DOWN	2,026,000	DOWN	11,118,000
Completions	1,031	No change		UP	2
Refinery runs	7,370,000	DOWN	19,000	UP	402,000
Gasoline stocks	162,198,000	UP	1,242,000	DOWN	1,362,000
Distillate stocks	100,111,000	DOWN	5,021,000	UP	765,000
Four-product stocks	340,552,000	DOWN	6,066,000	UP	3,090,000
Total imports	1,217,300	DOWN	134,500	UP	44,800

TOTAL DEMAND—ALL OILS



Only High Winter Demand Can Support Current Refinery Runs

REFINERY runs have averaged 7,380,000 bbl. daily for the first 2 weeks of the new year. The first week's average was an all-time record of 7,389,000 bbl. daily with the second week dropping only 19,000 bbl. daily.

Some company economists estimated that January demand would average as much as 9,500,000 bbl. daily with some decline in February and a much larger drop in March. This pattern of first-quarter demand is based on normal weather and marketing practices. Actual sales to consumers tend to drop off more than actual consumption toward the end of the heating season since the homeowner expects to have very little fuel in his tank at the end of the season.

Primary sales of heating oils drop off even more during February and March since these sales reflect not only the consumers' reductions in inventories but also the end-of-season inventory shifts of secondary suppliers and jobbers.

If total demand averages 9,500,000 bbl. daily in January, or even 9,400,000 bbl. daily, refinery runs of the past 2 weeks will still permit normal seasonal reductions in total inventories. But, if this rate is continued into the period of reduced demands in late February and March, total stocks will not be down to the desirable working level at the end of the first quarter.

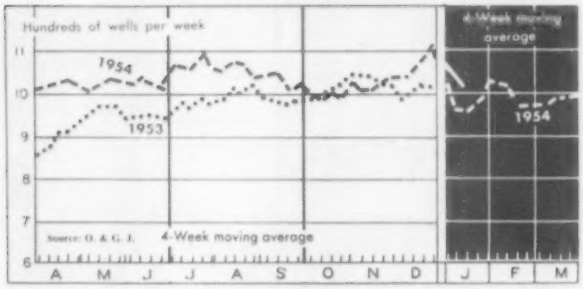
If demand averages 9,500,000 bbl. daily for January, refinery runs of 7,380,000 bbl. daily will permit a stock reduction of better than 5,000,000 bbl. per week.

Production at natural-gasoline and cycling plants will average about 720,000 bbl. daily in January, and current reports of product imports indicate an average of about 600,000 bbl. daily for the month. If crude transfers, exports, and losses average about 60,000 bbl. daily, the total supply from these sources will amount to 1,380,000 bbl. daily. The remaining 8,120,000 bbl. daily of demand must be supplied either from current refinery runs or from accumulated product inventories.

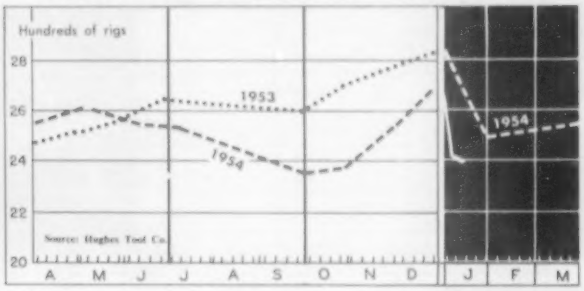
If refinery runs average 7,380,000 bbl. daily, the same as for the first 2 weeks of the month, product stocks will be reduced at the rate of 740,000 bbl. daily or 5,180,000 bbl. per week. If total demand averages only 9,400,000 bbl daily, the stock reduction would be cut to 640,000 bbl. daily or 4,480,000 bbl. per week.

For the past 4 years, total demand in March has been about 93.8 per cent of the January demand. For a normal season, the ratio of March to January would be slightly less, but if we use 93.8 per cent for this year, an average demand of 9,500,000 bbl. daily in January would mean about 8,900,000 bbl. daily for March. Slight reductions in imports from the January estimate would leave about 7,550,000 bbl. daily to be supplied by runs and stock reductions. Runs of 7,380,000 bbl. daily would permit stock reductions of only 170,000 bbl. daily or only a little more than 5,000,000 bbl. for the entire month. Stocks should be cut at least 40,000,000 bbl. in the first quarter, and more than 5,000,000 bbl. will be needed in March.

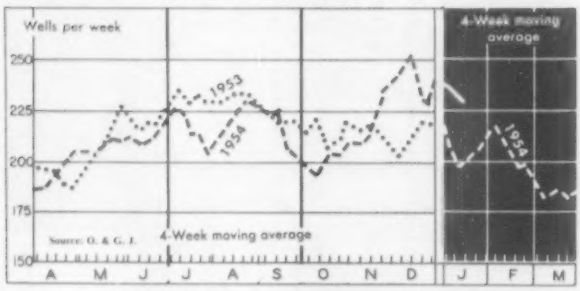
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS

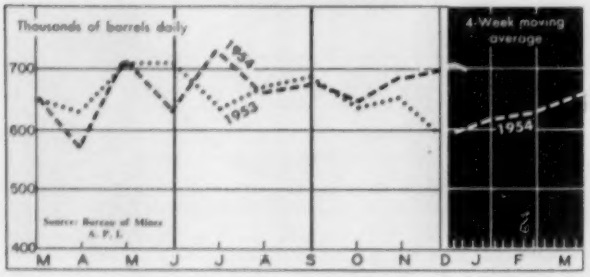
Area—	1-17-55	Change from 1-10-55	Change from 1-18-54
Gulf Coast	542	—10	10
N. and W. Texas-New Mexico	755	12	— 16
Arkansas-N. Louisiana-E. Texas	183	— 1	22
Oklahoma	282	3	— 63
Kansas-S. Nebraska	167	— 3	22
Illinois-Eastern	119	7	1
Rocky Mountain	202	—14	— 59
Pacific Coast	148	— 3	— 18
Total United States	2,398	— 9	—101
Western Canada	197	13	45

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JANUARY 15, 1955

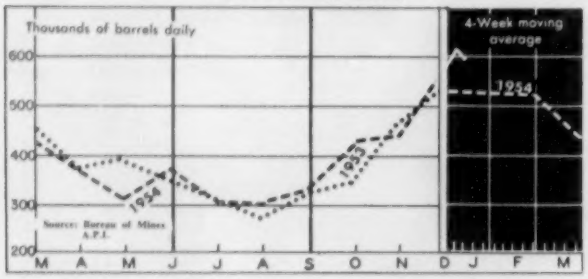
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1955	Cum. 1954	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1955: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	2	0	0	2	17,606	5	5	0	0	0	2	2	0	0	0	5	5
Arkansas	9	2	0	7	36,066	19	37	0	0	0	4	4	0	0	0	6	6
California	50	30	0	20	257,491	89	103	0	0	0	15	15	0	0	1	22	23
Colorado	22	3	2	17	125,620	49	42	0	0	1	12	13	0	0	2	27	29
Illinois	102	58	0	*44	259,569	173	126	0	0	0	11	11	3	0	0	18	21
Indiana	0	0	0	0	0	21	32	0	0	0	0	0	1	0	0	8	9
Kansas	84	38	7	39	294,928	229	166	2	0	0	15	17	5	0	0	49	54
Kentucky	3	0	2	1	6,478	46	36	0	0	0	0	0	1	0	0	8	9
Louisiana	103	65	11	27	608,260	163	155	2	0	0	7	9	3	2	3	12	20
North	69	50	10	9	173,581	98	84	0	0	0	2	2	0	2	1	3	6
South	34	15	1	18	434,679	65	71	2	0	0	5	7	3	0	2	9	14
Michigan	12	4	0	8	38,276	29	27	0	0	0	6	6	1	0	0	14	15
Mississippi	9	3	0	6	69,033	21	11	0	0	0	6	6	0	0	0	8	8
Montana	6	3	0	3	27,376	17	13	0	0	0	3	3	1	0	0	6	7
Nebraska	13	4	0	9	71,685	24	18	0	0	0	9	9	1	0	0	13	14
New Mexico	11	6	5	0	48,469	33	40	0	0	0	0	0	0	0	0	6	6
Northwest	5	0	5	0	15,478	7	5	0	0	0	0	0	0	0	0	0	0
Southeast	6	6	0	0	32,991	26	35	0	0	0	0	0	0	0	0	6	6
North Dakota	6	4	0	2	46,175	10	13	0	0	0	2	2	0	0	0	3	3
Ohio	19	5	7	*7	31,850	33	43	0	0	1	0	1	0	0	1	1	2
Oklahoma	142	87	5	†50	455,212	289	364	2	0	1	12	15	3	0	1	30	34
Pennsylvania-New York	36	10	12	†14	84,103	72	113	0	0	0	0	0	0	0	1	0	1
Texas	373	241	17	115	1,584,199	696	593	12	0	3	70	85	25	1	6	139	171
Southwest (1 & 4)	65	43	1	21	230,431	112	68	3	0	1	11	15	4	0	2	21	27
Gulf Coast (2 & 3)	50	21	6	23	327,088	106	103	2	0	1	10	13	4	1	3	26	34
East (5 & 6)	31	10	4	17	154,597	41	20	1	0	0	11	12	2	0	0	13	15
North Central (7-B & 9)	100	65	0	35	295,686	217	229	2	0	0	24	26	10	0	0	48	58
West (7-C & 8)	97	81	0	16	474,888	182	154	4	0	0	14	18	5	0	0	31	36
Panhandle (10)	30	21	6	3	101,509	38	19	0	0	1	0	1	0	0	1	0	1
Utah	5	1	0	4	32,508	5	8	0	0	0	4	4	0	0	0	4	4
West Virginia	12	2	8	2	30,219	18	17	0	0	0	0	0	0	0	0	0	0
Wyoming	11	6	0	5	61,164	20	37	0	0	0	4	4	0	0	0	7	7
Miscellaneous (Wash.)	1	0	0	1	3,952	1	4	0	0	0	1	1	0	0	0	1	1
Total United States	1,031	572	76	383	4,190,239	2,062	2,003	18	0	6	183	207	44	3	15	387	449
Total previous week	1,031	549	59	423	4,049,696			26	3	9	204	242	26	3	9	204	242
Total January 16, 1954	1,029	527	64	438	4,329,889			24	3	8	211	246	52	6	15	395	468

Service wells included: *2, †7.

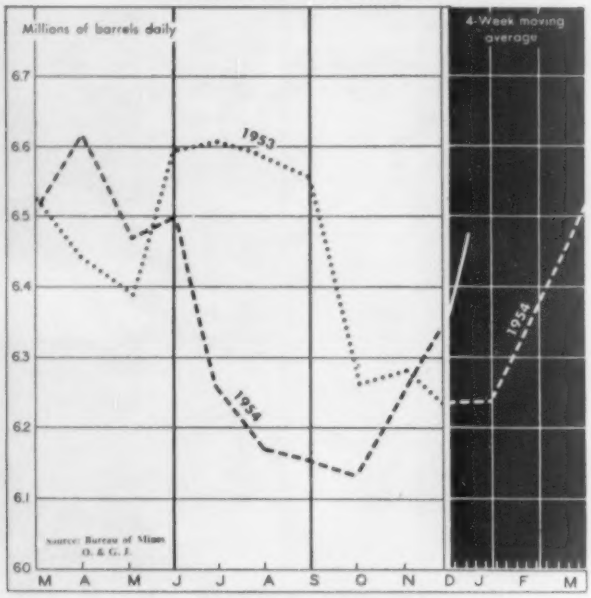
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION



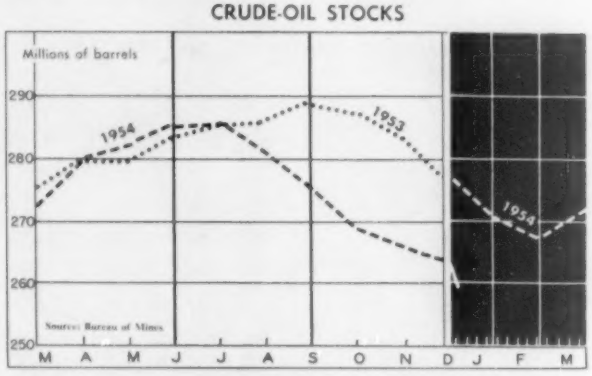
DAILY AVERAGE PRODUCTION FOR WEEK

	January 15			Jan. 8
	Crude oil	Lease condensate	Total	total
Alabama	4,300	.....	4,300	4,200
Arkansas	71,750	400	72,150	72,600
California	956,100	.....	956,100	963,700
Colorado	139,100	.....	139,100	139,300
Eastern	51,900	.....	51,900	51,900
Florida	1,450	.....	1,450	1,450
Illinois	204,800	.....	204,800	205,600
Indiana	29,700	.....	29,700	29,200
Kansas	332,200	.....	332,200	297,900
Kentucky	39,300	.....	39,300	39,200
Louisiana	632,900	52,950	685,850	685,850
North	100,900	2,950	103,850	103,850
South	532,000	50,000	582,000	582,000
Michigan	32,300	.....	32,300	32,700
Mississippi	90,700	3,775	94,475	94,475
Montana	38,900	.....	38,900	36,100
Nebraska	25,100	.....	25,100	23,800
New Mexico	213,900	2,625	216,525	216,425
North Dakota	25,800	.....	25,800	26,700
Oklahoma	521,100	.....	521,100	459,700
Texas	2,861,000	52,975	2,913,975	2,913,975
Dist. 1	46,000	450	46,450	46,450
Dist. 2	149,000	8,075	157,075	157,075
Dist. 3	446,700	25,150	471,850	471,850
Dist. 4	252,000	6,175	258,175	258,175
Dist. 5	50,700	525	51,225	51,225
Dist. 6	123,700	5,500	129,200	129,200
East Texas field	240,500	.....	240,500	240,500
Dist. 7-B	140,800	25	140,825	140,825
Dist. 7-C	179,600	4,550	184,150	184,150
Dist. 8	958,000	1,925	959,925	959,925
Dist. 9	189,000	575	189,575	189,575
Dist. 10	85,000	25	85,025	85,025
Utah	4,500	.....	4,500	4,300
Wyoming	261,200	.....	261,200	257,400
Others	‡400	.....	‡400	‡300
Total U. S.	6,538,400	112,725	**6,651,125**	6,556,775
Change from previous week, up			**94,350**	
Canada	†335,450	.....	†335,450	†293,575

Total U. S. production January 1-January 15 ..... 98,791,300 bbl.
Same period last year (crude plus cond.) ..... *93,773,600 bbl.

*Includes 1,473,250 bbl. condensate. †Week ended previous Monday. ‡S. D. 200, Nev. 200.

CRUDE-OIL STOCKS



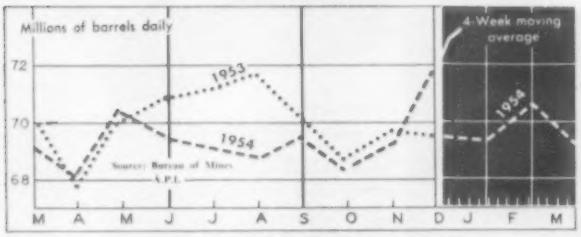
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

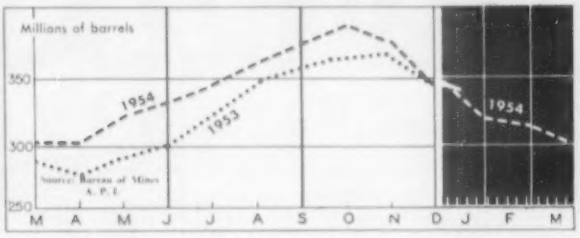
	Jan. 8, '55	Jan. 1, '55	Jan. 9, '54
Pennsylvania Grade	2,982	2,961	2,521
Other Appalachian	1,611	1,653	1,713
Illinois, Indiana, Michigan	11,411	11,800	11,598
Nebraska, North Dakota	1,914	1,721	(‡)
Kansas	8,328	8,657	9,079
Oklahoma	24,927	25,204	25,545
Arkansas	3,047	3,278	3,379
Louisiana	14,378	14,428	16,141
North	2,278	2,383	2,834
South	12,100	12,045	13,307
Mississippi	3,087	2,897	3,471
New Mexico	8,148	8,166	9,276
Texas	119,226	118,564	127,343
East Texas proper	9,633	9,899	11,228
West Texas	52,444	52,830	54,884
Texas Gulf	24,604	23,258	26,281
Other Texas	32,545	32,577	34,950
Wyoming	13,921	13,980	13,766
Other Rocky Mountain	5,610	5,309	2,835
California	30,579	31,249	33,488
Foreign	10,291	11,619	10,423
Total	259,460	261,486	270,578

*Bureau of Mines. †Includes 3,239,000 bbl. in California. ‡Included with Kansas.

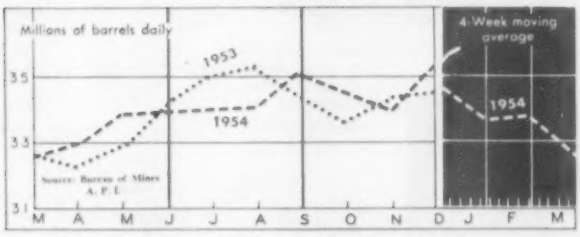
REFINERY RUNS



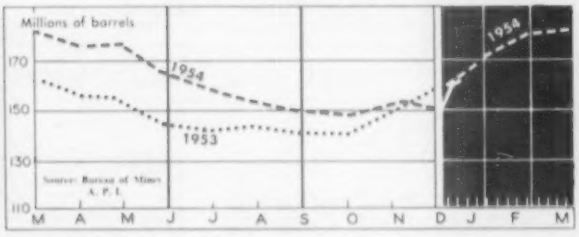
FOUR-PRODUCT STOCKS



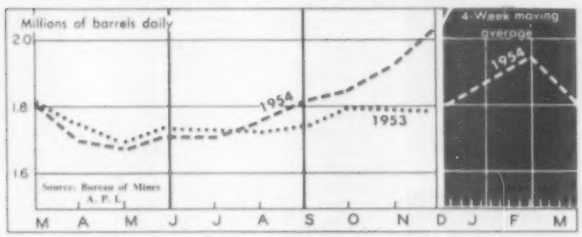
GASOLINE PRODUCTION



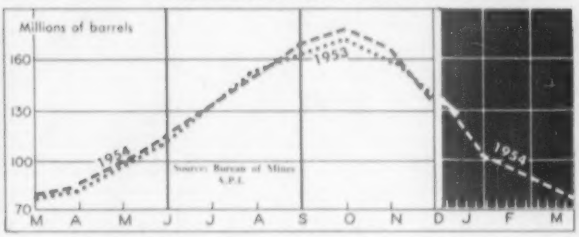
GASOLINE STOCKS



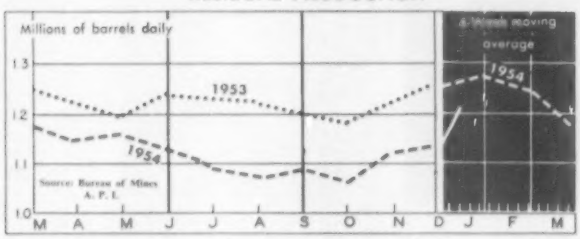
MIDDLE-DISTILLATE PRODUCTION



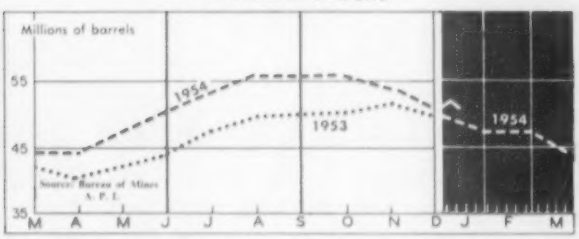
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, JANUARY 14

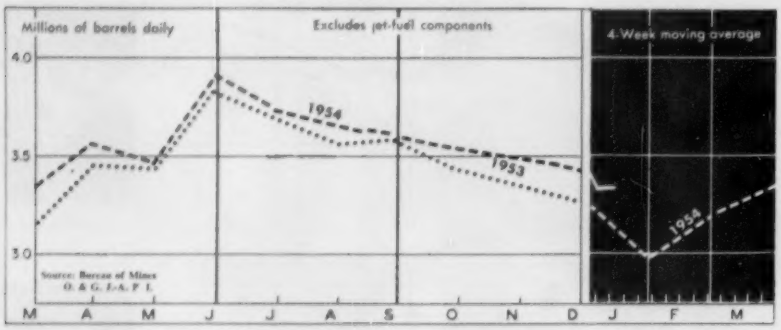
(Excludes all jet-fuel components)

(Thousands of barrels)

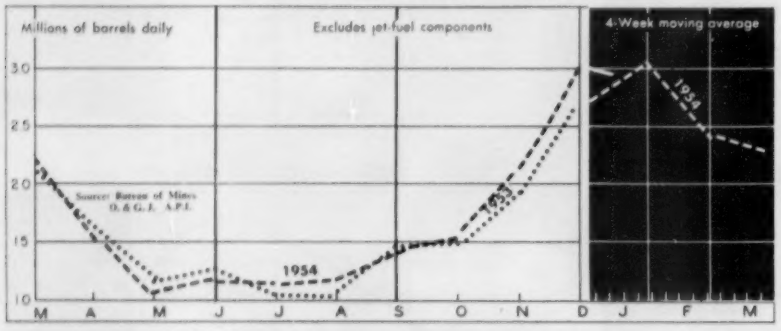
District—	Daily avg. runs	Daily average production — Gaso.*	Kero.	Dist.	Resid.	Stocks‡ — Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, January 1954 — Daily avg. runs	Daily average production — Gaso.*	Kero.	Dist.	Resid.
East Coast	1,070	431.2	32.3	295.1	257.3	32,169	11,559	36,119	8,903	1,043	424.7	40.0	253.2	253.4
Appalachian:														
District 1	104	45.7	6.3	25.7	10.0	4,743	611	2,140	522	117	47.0	7.0	26.4	15.6
District 2	81	38.1	6.2	12.6	11.1	2,256	360	669	227	95	49.4	7.6	17.1	15.1
Ind., Ill., Ky.	1,365	679.7	78.9	316.1	173.7	35,951	7,287	18,075	3,671	1,310	692.6	86.5	241.9	193.7
Okla., Kans., Mo.	690	384.3	17.1	186.3	48.3	15,953	1,707	10,690	1,208	569	345.0	13.1	130.4	51.9
Inland Texas	227	167.3	8.4	46.6	21.9	6,040	364	1,802	1,314	241	169.0	13.5	37.3	30.6
Texas Gulf Coast	1,836	825.0	153.3	446.3	237.8	23,962	2,275	12,062	4,289	1,643	749.0	135.7	388.1	228.4
La. Gulf Coast	630	307.0	79.9	151.1	48.8	10,926	2,257	3,798	1,260	551	263.9	65.5	143.7	44.8
N. La. and Ark.	93	38.4	9.1	22.3	8.7	4,233	649	1,445	166	85	37.8	8.5	20.5	7.6
Rocky Mountain:														
New Mexico	18	10.6	0.6	3.0	2.9	192		89	32	19	12.0	1.0	2.5	3.3
Other Rocky Mtn.	260	122.1	4.4	63.4	41.0	6,490	212	2,052	824	229	116.6	4.4	48.3	41.3
California	996	491.2	6.6	149.9	386.6	19,283	396	11,170	28,150	1,045	446.8	7.1	157.5	385.2
Jan. 14, 1955	7,370	3,540.6	403.1	1,718.4	1,248.1	162,198	27,677	100,111	50,566	6,947	3,353.8	389.9	1,466.9	1,270.9
Jan. 7, 1955	7,389	3,627.4	406.3	1,777.7	1,268.0	160,956	28,465	105,132	52,065					
Jan. 16, 1954	6,968	3,382.4	384.7	1,469.4	1,274.7	163,560	25,490	99,346	49,066					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

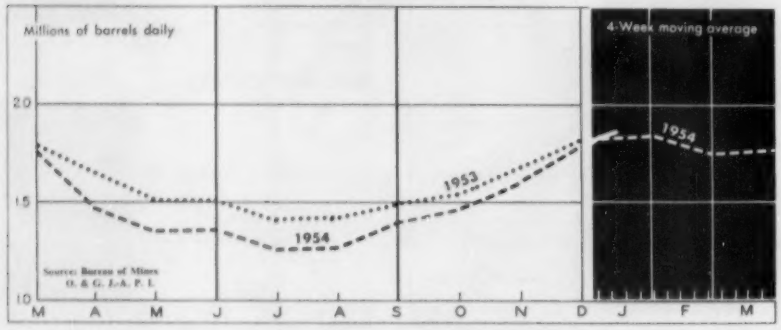
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of January 19, 1955. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.25-11	11.25-12	10.50-10.75
Premium gasoline	11.25-12	13-13.75	11.50-11.75
42-44 w.w. kerosine	9.75-9.875	10.7	9.5-9.75
No. 2 straw fuel oil	8.875-9.0	9.95	9.0-9.25
No. 6 residual	$1.50-1.60	$2.35-2.45	$1.85-1.95

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.5	5.0	5.25
Grade 18-55	6.6	6.1	6.35

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

• Recent reductions in spot tanker rates have removed some of the pressure for higher kerosine and distillate prices on the East Coast. Unless cold weather over the next 3 weeks boosts distillate demand in the Northeast, reduced need for spot tankers could start the seasonal decline in the tanker market.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 1-14-55	3,581	3,312
October 1954	3,457	3,515
December 1953	3,453	3,253
January 1954	3,354	2,985
Middle distillate:		
Four weeks ended 1-14-55	2,127	2,933
October 1954	1,854	1,513
December 1953	1,794	2,707
January 1954	1,857	3,076
Residual fuel:		
Four weeks ended 1-14-55	1,213	1,853
October 1954	1,066	1,448
December 1953	1,247	1,809
January 1954	1,271	1,831

CRUDE PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.*	Oklahoma, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87	....	....	....
15-15.9	1.93	....	....	....
16-16.9	1.99	....	....	....
17-17.9	2.05	....	....	....
18-18.9	2.11	....	....	....
19-19.9	2.18	....	....	....
20-20.9	2.24	$2.50	....	$2.37
21-21.9	2.30	2.52	....	2.39
22-22.9	2.37	2.54	....	2.41
23-23.9	2.45	2.56	....	2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9	....	2.76	3.09	2.63
34-34.9	....	2.78	3.11	2.65
35-35.9	....	2.80	3.13	2.67
36-36.9	....	2.82	3.15	2.69
37-37.9	....	2.84	3.17	2.71
38-38.9	....	2.86	3.19	2.73
39-39.9	....	2.88	3.21	2.75
40 and above	....	2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Sour. Includes New Mexico Permian.

Effective dates: California, February 16 1953; east of California, June 15, 1953; Pennsylvania Grade, December 1, 1954.

FLAT CRUDE PRICES

Representative posted schedules per barrel

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.35
Middle District	3.25
Southwest Pennsylvania	2.93
West Virginia	2.82
Ohio	2.76
Illinois Basin	2.90-2.95

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SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

CORE DRILLS-URANIUM. Power core drills for all depths. New and used spudders, rotaries, well drilling equipment and supplies. Compressors for air operation. Pressey & Son, Pueblo, Colo.

FOR SALE: Wilson Titan Drawworks, Serial No. 6539, Foster Catheads, Hydramatic Brake, All Chains, 3-Engine Compound & Gear Box, Excellent condition, or Will Consider Trading for Truck-Mounted Franks or Cardwell Rig for Workover. Southwestern Supply & Equipment Co., P. O. Box 14357, Houston 21, Texas.

FOR SALE: Used Model 15-A-15 Fluor Aerator Cooling Tower. To be dismantled by purchaser. Frawley Corp., 8790 Hays, Culver City, Calif.

DIESEL GENERATOR FOR SALE—Army Spec. PE-245-A. Model HI-600 Cummins engine with A.C. Rogers Diesel & Aircraft Corp., generator, 3 phase 120/208 volts; 86.5 amps; 31.2 K.V.A.; 60 cycles; 25 K.W.; 1200 R.P.M. Complete with exciter, control panel, steel base mounting. In operation 30 hours. Contact Adrian Westbrock, University of Dayton, Dayton, Ohio.

THREE #12 Sweetland Filters, 48 bronze leaves, monel covered, on 3" C.C., now located in southwest, available for inspection. 11 Sperry 18" x 18" cast iron Filter presses. 11 chambers. Consolidated Products Co. Inc. #65 Garden Street, Hoboken, N. J. N. Y. Tel.: BArclay 7-0600.

WILSON ATLAS—Bargain price; 2-LI-600 Cummins in good condition; enclosed oil-bath compound: includes one American and one plain cathead, one 1000 Gal. full tank. Call Madison 1923, Houston or Amherst 73311, Wichita or write P. O. Box 2001, Wichita, Kansas.

USED EQUIPMENT

Two Franks Model 4000-TM Single Drum Well Servicing Units. Single Pole Mast. Truck Mounted.
Franks Model Super East Texas Single Drum Well Servicing Unit. Truck Mounted. Handles 6500' work.
Franks Model East Texas Single Drum Well Servicing Unit. Single Pole Mast. Truck Mounted. Handles 4000' work.
Two Cardwell Models KS Single Drum Well Servicing Unit. Single Pole Mast. Industrial engine. Mounted on trucks.

50/60 Ideco Skid Servicing Unit. Double Pole Mast. Mounted on International Tandem Truck.
Franks SAL 4500 Skid Rotary Rig Cummins Power, 96' Derrick. Located, Tulsa, Oklahoma.
O.C.S. Type 3 Servicing Unit mounted on 1942 Mack Truck. Located Odessa, Texas.

Write, Wire or Call

FRANKS MFG. CORPORATION
BOX 3218, WHITTIER STATION
TULSA, OKLAHOMA

FOR SALE EQUIPMENT

FOR SALE: ENGINE—165 Hp. Climax Model R61, maximum continuous Hp. rating 126. Herndon Drilling Company, 421 Mayo Building, Tulsa, Phone 4-9700.

FOR SALE—Horizontal Duplex Steam Pumps—10x8½x12—353 GPM—bronze fitted —max. discharge pressure 100 lbs.—6" suction—5" discharge—mfg. by American Marsh Co. Quantity available—NEW—Boston Metals Co. 313 E. Baltimore St., Baltimore 2, Md., Curtis 7-5050.

SWEET GASOLINE Plant Liquidation: Heat Exchangers—1530, 310, 265, 65, 26 sq. ft., Columns—84" x 30'; 72" x 28'; 72" x 16'; 60" x 24'; 48" x 24', 42" x 44'; 36" x 42'; 24" x 45'. Tanks—Storage & Pressure, 100 to 25,000 gal. Compressors—14/11 x 20, 300 PSI; 14/12½ x 20, 175 PSI; 13" x 16", 75 PSI—all gas driven. Pumps—Centrifugal—1¼" to 8". Boilers—150 HP, gas fired, 150 PSI HRT. Misc.—Instruments, motors, stacks, pipe, etc. Heat & Power Co., Inc., 310 Thompson Bldg., Tulsa 3, Okla.—Phone: 3-4890. 70 Pine St., New York 5, N. Y.—HAnover 2-4890.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

FOR SALE EQUIPMENT

LARGEST SELECTION new and used cable drilling tools in the east; thousands of bargains, big savings, write us your requirements. Pipe, tubing, fishing tools, underreamers. We buy, sell, rent. Tri-State Tool, Box 827, Parkersburg, W. Va.

COMPLETE STOCK of Diesel & Gas Generator Units, 50 & 75 KW Caterpillar Diesels, Buda, Cummins, G.M., Waukesha, Hercules, Kohler, 5 to 100 KW, both AC and DC. Give us your inquiries. Southwestern Supply & Equipment Co., P. O. Box 14357, Houston 21, Texas.

GASOLINE PLANT *FOR SALE*

Gasoline Plant, located in Brazoria County, Texas, shut down in January, 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Adequate storage tanks for all products. Drum Lead Blending Plant. Detailed inventory available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 870, Ft. Worth, Texas

ANOTHER BRILL LIQUIDATION!

FORMER CONSUMERS COOPERATIVE REFINERY
LEVELLAND, TEXAS
(30 Miles West of Lubbock on Highway 290)

3'10" x 38" Vessel, 325# WP
5'3" x 38'6" Vessel, 90# WP, Chr. Lined
8—5000, 2000, 1200 bbl. Bolted Tanks
10—2000, 1000 bbl. Welded Tanks
6' x 58' x ⅜" Shell Fractionating Tower, chr. lined; built 1951, used 9 months.
6'6" x 55'; 6' x 27'; 5' x 27'; 3' x 49'; 30" x 35' Towers.
1800, (4)500 sq. ft. Adm Ht Exchangers.
600, 500 sq. ft. Chr. Steel Ht Exchangers.
200, 268, 730 sq. ft. Steel Reboilers.
1000, 750, 500, 300, 250 sq. ft. Steel Ht Exchangers.
BJ 5 Stage Ni. Chr. Centrifugal Pump, 400 GPM, 2100 ft. hd.
20—2", 3", 4" BJ Centrifugal Pumps XPF Motors.
15—Duplex Piston Pumps from 6" x 3½" x 6" to 14" x 6¾" x 12".
IR 15" x 7" x 14" Steam Driven Duplex Air Compressors.
3—Upshot Heater Stills, chr.-moly. Tubes
4—Water Tube Boilers—511, (3)205 hp.
Ethyl Lead Plant complete with Tank, Weigh Scale, Pumps, Meters, etc.
4-Spot Truck Loading Dock, built 1952, complete with Meters, pumps, etc.

Thousands of Feet 2", 4", 6" Pipe; unused 2", 4", 6" Pipe (Schedule 40, 80, 160) Unused 3" Boiler Tubes; 3", 3¼" chr. Still Tubing; Valves; Fittings; Return Bends; Hardware too numerous to mention.

Detailed Circular Upon Request.

BRILL EQUIPMENT COMPANY
4101 San Jacinto St., Houston 4, Texas. Locust 1351
New York Office: 2401 Third Ave., New York 51, N. Y. Cypress 2-3703

FOR SALE EQUIPMENT

GAS COMPRESSORS: Twin Clarks, Twin Bessemers, Twin Coopers, Angle Type units. Compressor Cylinders, Alfred B. Kern, 227 Wright Building, Tulsa 3, Oklahoma.

WILSON GIANT Single Engine Drawworks in good condition, complete with JL1335 Buda Engine and Parkersburg Hydromatic Brake, reasonably priced. Write Louisiana Iron & Supply Company, Box 966, Longview, Texas, or call Plaza 9-4421.

FOR SALE: 1—5x6, 1—4x12, 1—5x12 National Transit Triplex Pumps. 2—55 HP Ingersoll-Rand engines, 1—GE 60 HP explosion proof motor, complete with automatic controls. Also have large quantity of 2" Tubing & Rods, 6¼" Casing—all re-conditioned. KIEFER PIPE & STEEL CO. P. O. Box 475, Olean, N. Y. Ph. 2-1428.

FOR SALE at Drumright, Oklahoma, 19,500' of 7"—20#—J-55 New Seamless Casing, attractive price. Deep Rock Oil Corp.—Hvitt—Phone 2-4351—Tulsa.

FOR SALE: National RB 7½ Double Drum Drawworks, with Hydramatic Brake, Chains; National Model 3426 Drawworks, with Chains. Southwestern Supply & Equipment Co., P. O. Box 14357, Houston 21, Texas.

FOR SALE: 3600' 4½" extra hole drill pipe, good for shallow drilling, $.90 per foot. Terms. Melton Supply Company, Box 1360, Seminole, Okla.

FOR SALE: 3—Buda model PCS 1879-172 H.P. super charged 6-cylinder gas engines complete mounted on individual steel skids. Each engine is less one head. Price in present condition at our Geneseo, Kansas Pipe Line Yard, $1,500.00 each. 1—Cooper-Bessemer 550 H.P. diesel engine JS7RH #1571, 400 RPM, vertical 7-cylinder complete with Faulk gear coupling; Westinghouse speed increaser style 2LA3953. Speed high side 3420 low side 400; connected to B J pump #152951 type OL 6-stage centrifugal 6-inch suction 4-inch discharge. Price in present condition and location installed at Pump Station near Hoisington, Kansas, $14,500.00. Contact Ray—Purchasing Department, Continental Oil Company, Ponca City, Oklahoma.

FOR SALE—At our Oklahoma City warehouse, attention T. P. Mace, 13" used Harcraft Hydropneumatic Pumping Unit, complete. Complete details upon request. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

WANT EQUIPMENT: Did you find the equipment you wish to purchase in this column? If not, use an "Equipment Wanted" classified advertisement to find it. It is available somewhere and Journal classified advertisements will find it. See box heading for classified rates, or write The Oil and Gas Journal.

EQUIPMENT WANTED

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

WANTED: Failing 1500, or equivalent with long mast, large pump, and drill collars. Reply to Box 7064, Tulsa 18, Oklahoma.

DRILLING, Production Machinery, Spools, Tongs, Slips, Elevators, Preventers, Subs, Flanges, Tools, etc. Please advise price, condition, location. Representative will contact you. Box H-581, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED GOOD 4500' Rotary Rig with 3½" drill pipe less derrick. Mail description price asked to Box 835, Houston 1, Texas.

WANTED: Good used well servicing unit for 1000 feet wells, mast required. Full information, price & inspection location. Box 392—Brilliant, Ohio.

EQUIPMENT NOT IN USE: Did you find a buyer in this column for the equipment you have for sale. Someone wants it and an "Equipment For Sale" classified advertisement in the Journal will find a buyer. See box heading for classified rates or write The Oil and Gas Journal.

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

HELP WANTED

WANTED: Mechanical Engineer to design and develop Line of Mud Pumps for prominent drilling rig manufacturer. Give experience and education. Box H-589, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED EMPLOYEES, for all positions on seismograph field crews, wanted by aggressive, expanding geophysical company. Please give full details of education, experience, salary expected, in first letter. Box H-566, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER with Masters Degree, or Doctor's in Chemical, Mechanical, or Petroleum Engineering, for research and teaching in Reservoir Mechanics and related fields at rapidly growing Southwestern institution. Rank and salary open, twelve months employment possible, consulting work encouraged and available in immediate area. Applications will be kept confidential. Box H-570, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER or Geologist, age 27-35, for reserve estimates, valuation work, analysis oil and gas securities and financial studies. Must be experienced in preparing reports and have ability for original thinking and fluent writing. Location New York City with small, rapidly growing professional organization where the work load is heavy. Send letter detailing education, experience, work samples (if available) and salary expected. Box H-590, The Oil and Gas Journal, Tulsa, Oklahoma.

A SOUTHWESTERN oil field specialty manufacturer and sales firm doing in excess of $20,000,000 business per year wishes to employ a man 30 years old or younger who can do display catalog type mechanical drafting and air brush work for sales promotion. Interested parties should send sample of work, furnish all information asked on conventional application forms including picture and advise availability for interview. All replies will be held confidential and work samples will be returned if requested. Box H-588, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED and Capable Specialty Salesmen to sell valves to Production and Pipeline Divisions. Box H-563, The Oil and Gas Journal, Tulsa, Oklahoma.

CORROSION ENGINEER
21-30, must have electrical or chemical degree, but experience not essential. Job offers permanency, chance for advancement, liberal employee benefits. Reply to Personnel, Great Lakes Pipe Line Company, Drawer 2239, Kansas City 42, Mo.

PETROLEUM GEOLOGIST

"Top young man; major Co. experience in Mid-Continent area. Excellent opportunity with rapidly expanding Co. in Kansas and Colorado. Contact Personnel Director, 352 N. Broadway, Wichita, Kansas.

THE RIGHT MAN: Can you fill the position you have open from the qualifications listed in this column. Men are always looking for an opportunity to improve themselves. Use a "Help Wanted" Journal classified advertisement to find the men you need. See box heading for classified rates or write The Oil and Gas Journal.

FOR A BETTER-PAID JOB

Production and Reservoir Engineers, Geologists, Draftsmen; Geophysicists, Party Chiefs, Computers and Field Crew Staff. WRITE US—STRICTEST CONFIDENCE.

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for aggressive manufacturing company in midwest. Graduate engineers or engineering background, in design or development work for control equipment, used in oil and gas production. Organization also needs sales engineers experienced in above lines. Company offers excellent benefits with salary review every six months. Salary range $5000 to $7000. Company pays our service charges. All information confidential. Send resumes to

Chas. J. Loveless Personnel Service,
616 S. Main, Tulsa, Oklahoma.

SITUATIONS WANTED

SALES & PUBLIC Relations Executive desires position with drilling, exploration or supply firm interested in top level representation in Fort Worth and contiguous territory. Box H-571, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST-GEOPHYSICIST
AGE 31, five years major exploration experience and graduate study in West, Gulf Coast and offshore areas. Excellent references, location open, replies confidential. Box H-584, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE GEOLOGIST, 15 years experience, geological, petroleum engineering problems, major, independent companies, exploration etc., Valuations, mapping, log interpretations, high pressure completions, stripper production methods. Experienced Gulf Coast, Mid-Continent, foreign. Compensation commensurate with ability. References. Box H-592, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER, five years processing large refinery, ten years resident engineer rapid growth refinery, petro-chemical processing. Box H-591, The Oil and Gas Journal, Tulsa, Oklahoma.

NEWSMAN, oil writer, 33, speak Spanish, seeks writing-public relations job in South America. Box H-579, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE PETROLEUM ENGINEER, 36, married, desires position with independent operator. Experience in reservoir engineering, subsurface geology, drilling, production and unitization in East, North and West Texas, and New Mexico. Now employed. Box H-595, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING & PRODUCTION Superintendent, 20 years varied experience, 43 years of age. Best of reference. Box H-594, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER. Graduate, 10 years drilling, production, workover, appraisal and management experience desires to relocate. Prefer Mid-Continent or Gulf Coast Area. Box H-593, The Oil and Gas Journal, Tulsa, Oklahoma.

THE POSITION YOU WANT: Oil Industry companies are looking for men to fill every conceivable kind of position. If you didn't find the position in this column that you are looking for, use a "Situation Wanted" classified advertisement to state your qualifications. Some company is probably looking for your ability. See box heading for classified rates or write The Oil and Gas Journal.

REAL ESTATE

SPACE IS NEEDED: A Journal display classified advertisement is the quickest way to rent or sell your real estate. In the present period of expansion oil industry firms urgently need the space you have available. If it isn't listed here, you may also find it by stating your needs in these pages. For classified rates see box heading or write The Oil and Gas Journal.

SERVICES

OVER PAYING freight bills? We locate and recover over payments. Oil industry experts. Will reaudit bills. Straight commission. Box H-596, The Oil and Gas Journal, Tulsa, Oklahoma.

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Complete equipment, including Bilby Towers, Two-Way radios and Theodolites. Geodetic Methods.

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Houston, Texas—ATwood 7428

ROYALTIES

ROYALTY, one-eightieth, section 596 and 897, Yoakum County, Texas, non-participating, for sale. Write Dr. J. A. Robinson, 233 21st Place, Santa Monica, Calif.

OFFERING CHOICE PRODUCING oil income royalties with large reserves per Dollar investments. A. S. Berry, 817 Wright Bldg., Tulsa, Okla.

WISH TO BUY producing royalty. Send details. Box H-574, The Oil and Gas Journal, Tulsa, Oklahoma.

WISH TO BUY producing royalties. Box H-379, The Oil and Gas Journal, Tulsa, Oklahoma.

JACK EAGLE, Oil Properties, 706 City Nat'l. Bldg., Oklahoma City, Oklahoma, Telephone REgent 6-7027.

GET TOGETHER: Both Capital and Royalties are available. If the investment proposition you want isn't listed in this column, use a Journal classified advertisement to find it. See box heading for classified rates, or write The Oil and Gas Journal.

LEASE AND DRILLING BLOCKS

160 ACRE LONG TERM oil lease on producing dome, eastern Utah. Owner, R. Barnsley, 950 Lincoln Ave., Palo Alto, Calif.

SEE A. L. BOWLES, Box 947, Ada, Okla., for drilling deals and producing royalties if you have the cash for Oil Investments.

Will pay cash instantly for lease (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

LOOKING FOR A LEASE? There will be over 40,000 wells drilled this year. If you are looking for a lease, drilling block, or drilling deal and you haven't found it in this column, or if you have a lease or drilling block you want drilled, a Journal classified advertisement can find an interested party. See box heading for classified rates, or write The Oil and Gas Journal.

LEASES ROYALTIES

Producing and Nonproducing
Bought and Sold—Any Area

Inquiries Invited

B. D. BUCKLEY

6635 Delmar Ave., St. Louis, Mo.

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FOR ECONOMICAL FILING of full-size electric logs, most geologists prefer Kraftbilt E-24 4-drawer cabinet. Two compartments to each drawer with separate follow blocks make this cabinet handy, economical. For filing reduced electric logs, geologists use Kraftbilt E-28 8-drawer cabinet. Send for new Catalog 1054-B. Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Oklahoma.

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WANTED

WANTED—IDEAS

Inventions that are related or can be adapted to the oil industry. We offer capital, technical advice, patent assistance, market research, a manufacturing plant, and a sales outlet; everything to put your invention on the market. Write P. O. Box 1665, Houston 1, Texas.

Will purchase producing oil properties of any size. This is direct contact with purchaser.

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ORGANIZED GROUP of business men financially able to undertake uranium deals of unlimited size, operations, buying claims, active exploration, etc. You are dealing directly with us. Reasonable inquiries will receive prompt attention. Box H-587, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW OIL COMPANY buying proven oil and gas production with incomes ranging from $25,000.00 to $300,000.00 per month. You are writing directly to company officials. Financial statement will be presented to responsible sellers, principals, and authorized brokers. Box H-586, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE OWNER of acreage over Gas and Oil seepages needs financing to drill shallow wells in East Tennessee. Excellent structures. Gas markets nearby. Contact E. A. Munyan, 102 Fairview Drive, Fairfax, Va.

RECENTLY ORGANIZED Eastern group with venture money for drilling of wildcats, development, farmouts. You are dealing directly with principals. Box H-538, The Oil and Gas Journal, Tulsa, Oklahoma.

RECENTLY ORGANIZED group seeking proven oil property with an income of $10,000 to $40,000 per month. You are writing directly to the principals. Prompt action. Box H-526, The Oil and Gas Journal, Tulsa, Oklahoma.

Special Service in Houston Area for OIL EQUIPMENT MANUFACTURERS—SUPPLIERS

If you are **Not Located in Houston** but at times need Houston facilities—a Houston area sales representative; a Houston office, address, or telephone; warehousing; or a secretary. Let us furnish you with all or any part of these or other services. We are a small organization with experienced personnel, wide oil industry acquaintance, excellent reputation. Reasonable fee based on your requirements. Write to Advertiser, 2318 Sul Ross, Houston 6, Texas, or telephone LY-3907.

CUBA, THE NEW OIL COUNTRY:

Activities are rapidly expanding. Many Independents are already drilling. We control large areas throughout the entire Island. We also have large blocks in the actual producing fields (Bacuranao, Motembo, Jarahueca and Jatibonico) the latest discovery made by Kerr-McGee Oil Industries. This Company will drill 3 wells in the Jarahueca Field. We will sell 1/64th of each well for $1,000.00. We wish to contact party with a complete small rotary, preferably Cardwell model H, truck mounted, willing to sell or receive an interest for the use of the equipment.

CUBAN OIL ENTERPRISES,
Aguiar 574 St. Havana, Cuba.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

SOIL ANALYSIS

MOST USEFUL scientific book ever produced. Entitled: HOW TO FIND OIL. A proven formula of soil analysis which indicates the invisible presence of petroleum. PLUS—CLUES to surface indications of petroleum. Price $1.95. Surface Oil Surveys, 1414 Electric Bldg., Fort Worth, Texas.

Equipment Men

Kearney Named by Tex-Tube As Assistant Sales Manager

Tex-Tube, Inc., has announced the appointment of R. W. Kearney to assistant manager of sales. Kearney joined Tex-Tube 2 years ago following 10 years of experience in oil-production specialty sales and oil company employment.

Tex-Tube observes its tenth anniversary in 1955 as producer of electric-weld, shot-hole casing and mechanical tubing and as distributor for line pipe, industrial-alloy and carbon pipe and tubing, and specialties for the oil producer as liner casing and small-size oil-well tubing, as well as standard oil-well casing and tubing.

Du Pont Establishes New Sales, Service Groups

Petroleum Chemicals Division of E. I. du Pont de Nemours & Co. has established a new sales section and a new technical service group to prepare for new developments in the field of petroleum additives and to improve customer service, it has been announced by David H. Conklin, director of sales.

To improve the domestic sales setup for tetraethyl lead and other additives, new sales districts have been formed in the Middle Atlantic area with offices in Philadelphia, and in the Middle West with offices in Detroit. The new additives sales group, headquartered in Wilmington, Del., will be headed by R. M. Glover, formerly manager of the division's Mid-Continent region.

The technical service group will operate from the petroleum laboratory at Deepwater Point, N. J. It will be managed by W. E. Bettoney, who will be an assistant director of the laboratory. Bettoney formerly was an assistant

technical manager of the division in Wilmington.

L. Z. Carey, formerly an eastern region sales representative, will manage the new Philadelphia district. This district, designed to facilitate service to refiners in the Middle Atlantic states, will be within the eastern sales region.

The new Detroit district includes Michigan, northern Indiana, and northwestern Ohio. P. H. Richard, one of the division's automotive experts, has been named manager of this new district, which is to be a part of the central sales region.

D. W. Frison, formerly assistant manager of the Mid-Continent region, becomes the new manager of that region with offices in Tulsa. His assistant will be B. B. Russell, III, who has been the division's additives coordinator in Wilmington.

Fort Worth Bank Adds Two To Board of Directors

William Fleming and A. W. Tarkington, prominent Fort Worth oil men, have been elected directors at a meeting of Fort Worth National Bank's board of directors held December 30, 1954, according to an announcement made by Estil Vance, president.

W. FLEMING

TARKINGTON

Fleming is managing partner of Fleming Oil Co., and is associated with Kay Kimbell in the firm of Fleming & Kimbell. He started his career with his father in the drayage and livery business at Whitewright, Tex. He operated the first Chevrolet automobile agency in Texas at Bonham. In 1919 he entered the oil business in Wichita County.

Tarkington, vice president of Continental Oil Co., is regional general manager of the company's southwestern region, with headquarters in Fort Worth, Tex. He began his business career as a clerk with First National Bank of Dallas. In 1937 he left the bank to become credit manager and later assistant treasurer of Bethlehem Supply Co., Tulsa. He resigned this position in 1948 to become treasurer of Continental Oil Co., Ponca City, Okla. In 1950 and 1951 he served as assistant to the president of Continental Oil. In 1951 he was elected vice president of the company and was made regional general manager of the company's central region with headquarters in Oklahoma City. In 1953, Tarkington was promoted to his present position.

Caterpillar Establishes Los Angeles Parts Depot

Caterpillar Tractor Co. has established a new parts depot in Los Angeles to provide emergency overnight service to its distributors in southern California, southern Nevada, and Arizona, it has been announced by D. M. Gilbert, Caterpillar's parts-depot manager.

James Busey, who joined Caterpillar as a parts department employe 18 years ago and for the past 3 years has managed a similar parts depot at St. Paul, Minn., has been named manager of the southern California depot. He will be assisted by Robert Webster, who joined the company in 1940, and has been an export parts supervisor at Peoria, Ill., for the last 3 years.

The Los Angeles depot provides 40,000 sq. ft. of floor space for the storing and handling of parts.

Pelton Moves Mid-Continent Headquarters to Tulsa

D. P. Billings, general manager, oil-industry machinery division of Pelton Water Wheel Co., Los Angeles, has announced the relocation of its Mid-Continent headquarters from Dallas to Tulsa.

The Tulsa office is headed by Clyde Lietzow, manager of Pelton's Mid-Continent operations on sales and service activities, with warehouse facilities at Hobbs, N. M., and Odessa, Tex.

This relocation of the main Mid-Continent office was occasioned by increased activities of Pelton in the oil industry and will enable the company to render more complete service in the introduction of new products planned for the coming year.

Northern New Mexico

(Continued from page 173)

Swab test of Tensleep recovered only sulfur water. The operator is attempting to flow the well to pits.

Goshen County Wildcat Swabs Clean Oil

F. R. Anderson and others recovered 20 bbl. of clean oil on test of "J" sand perforations 6,917-26½ at 24-D-33 Airport, SE SE SW 33-24n-61w, Goshen County. Time of swab test was not reported. The test was run before sandfrac or other treatment, and the operators are now preparing to sandfrac. The top of "J" sand was logged at 6,290 ft., and a total of 23 ft. of saturated sand was reported. The wildcat is the first in this area of the Wyoming portion of the Denver-Julesburg basin to show for production. It is more than 40 miles from previous production in the basin.

NORTH DAKOTA

Bottineau County Test Flows

Ward-Williston Drilling Co. reported a flow of 384 bbl. of oil per day at 3 State-A, NE NW SW 36-164n-80w in the North Westhope field, Bottineau County. Production is from Charles at 3,226-47 ft. The producer is the fifth well in the field, and the gage is by far the best yet reported for a Bottineau County well. By contrast the entire county had production of 4,218 bbl. of oil during an entire representative month in 1954.

UTAH

Grand County Apparent Discovery Testing

King Oil Co. swabbed at the rate of 2 bbl. of oil per hour at 2 Unit, SW SE SE 11-26s-19e, Grand County. Production is from Mississippian, where the well earlier recovered oil on drill-stem test. Perforated zone and other detail has not been reported. The well also had shows in Paradox (Pennslyvanian).

Successful Wildcats

SOUTHWEST TEXAS
District 4

Starr County: W. U. Paul 2 Helene W. Lyons, GB&CNG Sur. 225. IPF 82.51 BOPD, ⅛-in. perfs. 4,230-36 ft., 45.1°, GOR 303:1. TD 4,833 ft. (New oil pay in Cameron field.)

Selby-Walker Corp. 1 Cornelia B. Rowe, San Jose Grant. Shut in gas well. Perfs. 7,458-65 ft. TD 7,656 ft. (Shut in gas well.)

TEXAS GULF COAST

Brazoria County: San Jacinto Petroleum Corp. 2 Corbett, W. D. C. Hall Sur., A-69. IP 165 BOPD, ⅛-in., 39°, Frio 7,852-58 ft. (perforations). TD 8,015 ft. (New pay in Bonney field.)

Harris County: General Crude Oil Co. 1 Hamons, WCRR Sur. 7, A-925. IP 2,100 M.c.f. daily, various chokes, perforations 7,267-72 ft. (Yegua). TD 7,800 ft. (New field—1½ miles southeast of South Bammel field.)

Victoria County: Wymore Oil Co. 1 Terrell, Peter Teal Sur., A-112. IP 8,500 M.c.f. daily, open flow, dry gas, perforations 4,138-44 ft. TD 5,172 ft. (New field.)

EAST TEXAS

Cass County: F. R. Jackson 1 Grogan Mfg. Co., Albert Emanuel Sur., A-327, 5 mi. SE Kildare. IP 156 BOPD, ⅛-in., 42°,

TP 990 psi., GOR 400, Mitchell sand 5,952-62 ft. TD 6,008 ft.

Gregg County: J. C. Robbins and F. R. Jackson 1 Grissom, Dinsmore Simpson Sur., 9 mi. SE Longview. IP 120 BOPD, ¼-in., 45°, TP 350 psi., Pettit 7,060-80 ft. TD 7,212 ft. Recompletion, previously completed dry at 7,209 ft.

TEXAS PANHANDLE

Hansford County: Stanolind Oil & Gas Co. 1 Mathews, NE NE SW 45-Sec. 117, H&TC Sur., IP 3,400 M.c.f. of gas per day, Morrow 7,128-34 ft. TD 7,515 ft. (Gas discovery).

WEST CENTRAL TEXAS

Callahan County: H. L. Erickson 1 Ross, Sec. 103, BBB&C Sur., 2 mi. NW Baird. IP 43 BOPD, ¼-in., 38°, TP 115 psi., GOR 225, King sand 1,530 ft. TD 1,534 ft.

NORTH TEXAS

Grayson County: Humble Oil & Refining Co. 1 Gee, Elizabeth Jones Sur., 4 mi. SW Sherman. IPP 115.3 BOPD, 24°, Simpson 9,288 ft. TD 9,427 ft. New pay.

WEST TEXAS

Coke County: Sunray Oil Corp. 6 Harris-Davenport, Seth Clark Sur. 475, 9 mi. N Bronte. IP 282 BOPD, 22/64-in., TP 550 psi., GOR 1,100, 46°, pay 5,300 ft. TD 6,230 ft.

Al G. Hill 2 Ralph Harris "C," Sec. 4, D. H. & J. W. Synder & W. Von Rosenberg Sur., 24 miles NW Robert Lee. IP 213 BOPD, 16/64-in., 47°, TP 600 psi., GOR 1,891, pay 5,634-67 ft. TD 6,489 ft.

J. B. Randle 1 Wojtek, 406-1-A-H&TC, 4 mi. N Robert Lee. IP 304 BOPD, 10/64-in., 43°, GOR 431, TP 200 psi., Canyon 4,913-56 ft. TD 5,660 ft.

Scurry County: The Texas Co. 226-F Fuller, 551-97-H&TC, 13 mi. N Snyder. IPP 223½ BOPD, 42°, GOR 171, Cisco pay 5,309 ft. TD 5,314 ft.

OHIO

Knox County: Frank Lyons et al 1 Wilford Colopy, Sec. 15, Union Twp. IP 1,300 Mc.f. daily, Clinton 2,878-2,929 ft. TD 2,964 ft.

SOUTH LOUISIANA

Assumption Parish: Humble Oil & Refining Co. 1 Norman-Breaux Lumber Co., 25-15s-13e. IPF 240 BOPD, 585 M.c.f. of gas per day, ⅛-in., 35.2°, perfs. 12,702-06 ft. TD 13,500 ft. (Extenson to East Lake Palourde field.)

Union Oil Co. of California 1-A Norman et al, 25-15s-13e. IPF 384 BOPD, 8/64-in. perfs. 13,388-98 ft., 38.5°, GOR 1247:1. TD 13,468 ft. (Extension to East Lake Palourde field.)

OKLAHOMA

Garvin County: Sinclair Oil & Gas Co. 1 Jones, C NW SE 29-4n-4w. IPF 156 BOPD, Hart sand 8,800-8,950 ft., 38°, ¾-in. choke. TD 10,425 ft. (Oil discovery).

Noble County: LaGorce Oil Co. 1 Hess, NW SW NE 33-22n-1w. IPP 26 BOPD, Sams sand 1,620-26 ft., 38°. TD 2,130 ft. (Oil discovery).

Texas County, Oklahoma Panhandle: Kansas-Nebraska 1 Brown, NW NW SE 25-2n-18eCM. IPF 6 BCPD, 8,760 M.c.f. of gas per day, 6,401-21 and 6,442-97 ft. TD 6,902 ft. (Gas discovery with some distillate).

KANSAS

Barton County: F. Raymond 1 Simmons, SE SE SW 3-18s-11w. IPP 25 BOPD, Lansing 3,076-80, 3,094-3,106 ft. TD 3,362 ft. (Opens Claflin pool).

Marion County: Anderson-Prichard Oil Corp. 2 Youk, C N½ S½ S½ 20-18s-2e. IPP 55 BOPD, Viola 3,019-20 ft., 31°. TD 3,020 ft. (Opens Youk pool).

COLORADO

Logan County: Strain Drilling Co. 1 Kapernick, C SW NE 25-7n-53w. Shut in gas well. TD 4,542 ft. "J" sand. "D" sand gas discovery, new field.

MANITOBA

Dome et al 13-9 West Ebor, LSD 13, 9-9-29w1. Lodgepole oil well. TD 2,760 ft.

Cal-Standard 6-7 South Regent, LSD 6, 7-4-21w1. Indicated oil well. TD 2,824 ft.

ALBERTA

Baysel 4-13 Supertest Dunn, LSD 4, 13-45-4w4. Indicated Devonian oil well. TD 2,450 ft.

Socony-CPR 27-10 Makepeace, LSD 10, 27-23-19w4. Madison oil well. TD 4,623 ft.

BRITISH COLUMBIA

White Lloyd 1 Halfway, LSD 16, 2-87-25w6. Indicated oil well. TD 4,114 ft.

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LEGAL

SEALED BIDS for Oil and Gas leases on the Crow Indian Reservation, Montana, will be received in the Office of the Superintendent, Crow Agency, Montana, until 2:00 O'Clock (M.S.T.), TUESDAY, FEBRUARY 15TH, 1955 at which time they will be opened and publicly read. Seventeen (17) Units involving 33,342.00 acres of trust Indian lands, a portion of which mineral rights are reserved for the benefit of the Crow Tribe by Act of Congress, will be offered. For further detailed information and a list of lands advertised call or write: L. C. Lippert, Supt., Crow Indian Agency, Crow Agency, Montana.

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— by reduced rod breakage
— by less downtime

Shutdowns and rod replacements . . . a costly item in pumper operation . . . are practically non-existent with the Parkersburg Air Balanced Pumper.

The use of shorter cranks and longer pitmans—placing the pitman between samson post and the horsehead, results in slower load acceleration on the upstroke. This reduction of load on the polish rod eliminates one of the greatest sources of rod trouble and breakage.

Check what you are paying now for downtime, rod breakage and replacement and you'll have a good idea what you can save by using Parkersburg Air Balanced Pumpers. Ask your nearest Parkersburg Representative for specific information about air balanced pumpers for your installations.

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For complete information, call the nearest Dowell station or write directly to DOWELL INCORPORATED, Tulsa 1, Oklahoma, Dept. A-11.

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